

STRUCTURE OF THE MICROCARD (BASIC INSTRUCTIONS)

A02 = How to use the microcard		1	2	3		4
					SIS	
A01 = Structure of microcard	-A-	***X*	X*XXX	XXXXX	XXXXX	*XXXX X
B01 = Trouble-shooting chart	-B-	*XXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	-C-	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	-D-	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	-E-	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XX
	-F-	XXXXX	XXXXX	XXXXX	XXX	
	-G-	XXXXX	XXXXX	XXXX		
	-H-					
	-J-					
	-K-					
	-L-					
	-M-					
N01 = Service Information	-N-	*XXXX	XXXXX	XXXXX	XXX	XX XX*
		12345	67890	12345	67890	12345 678
			1		2	

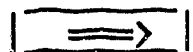
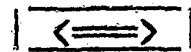
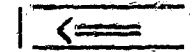

Index  
N28 = Table of contents and publication information

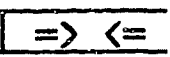
- 1 = Special features
- 2 = Safety and precautionary measures
- 3 = Test equipment and tools
- 4 = Installation position of components

- a. Read from left to right.
- b. Title of micropicture (appears on each coordinate).

E16	Product/component/test step	
	Coordinate	

c. Limits of section

			
Beginning	Mid-section	End	One-page section

A01		
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USAGE OF THE MICROCARD

System: Electronic ignition with knock control (EI-K)

Special features: self-diagnosis, characteristic-map change-over and charge-air pressure control.

Descriptions, photos, terminal designations and special features refer to the vehicle

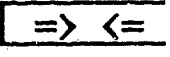
Alfa Romeo 75 Turbo with 061.34 engine  
Year of manufacture 1986 - Europe/Switzerland

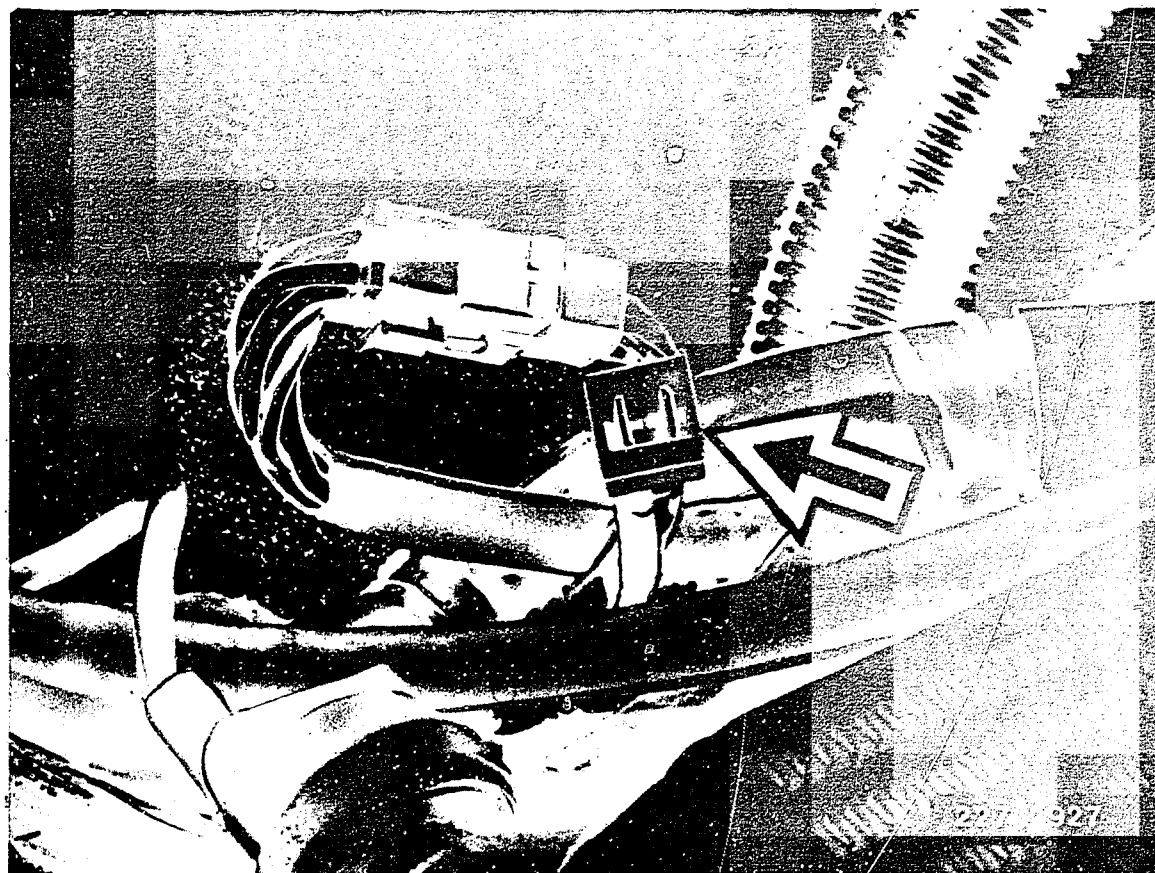
The basic instructions are detailed trouble-shooting instructions. They must not be used as instructions specific to this vehicle.

ATTENTION!  
Descriptions and photos may differ from the vehicle-specific brief instructions.

Take binding test specifications, terminal assignments and special features from the vehicle-specific brief instructions only.

Brief instructions, see microcard KF7 00..

A02		
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Arrow = Plug for characteristic-map change-over

## SPECIAL FEATURES

Plug without bridge = European characteristic map

Plug with bridge = Swiss characteristic map

## SAFETY AND PRECAUTIONARY MEASURES

### Danger of accident on electronic ignition systems

Increased demands of modern engines on the ignition system combined with the desire for freedom of maintenance have recently led to electronic ignition systems being fitted as standard.

Usually the ignition power of electronic systems (of almost all manufacturers) is higher than that of conventional systems, and there are signs of further increases in power. Electronic ignition systems thus reach a power range which can be highly dangerous if live parts of terminals are touched (both on the primary as well as the secondary side).

In this connection, we should like to point out that the VDE regulations, in particular VDE 0104/7.67 and/or the respective national regulations must be followed when testing or working on the ignition system.

The ignition should always be switched off when working on the ignition system (switch off ignition or voltage source).

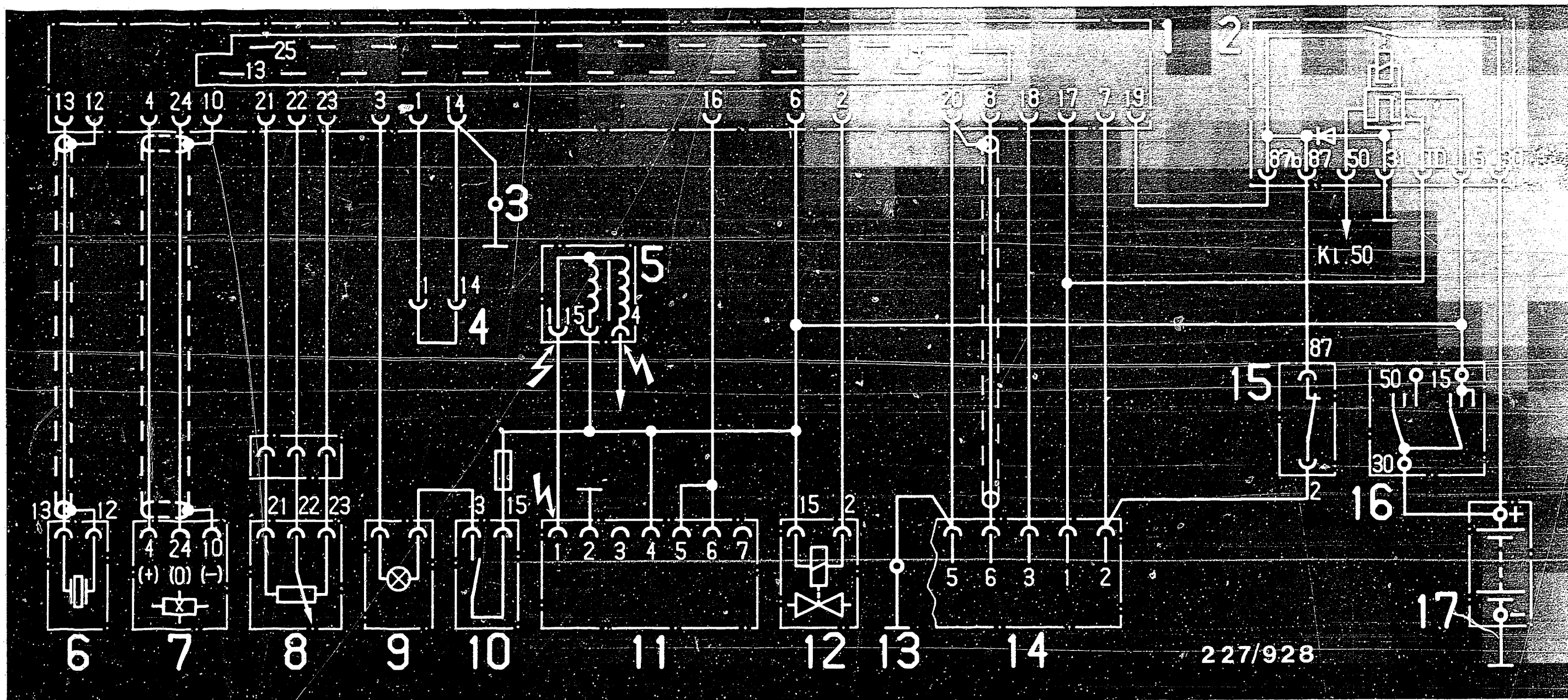
Such work includes:

- \* Connecting of engine test equipment (timing light, dwell-tach tester, ignition oscilloscope etc.)
- \* Replacing parts of the ignition system (spark plug, ignition coil, ignition distributor, H.T. ignition cable etc.).

If, while testing the ignition system or during adjustment work on the engine (e.g. mixture preparation), it becomes necessary to switch on the ignition (switch on the ignition or voltage source), the above-mentioned dangerous voltages occur over the entire system.

The danger of accident exists, therefore, not only on the individual assemblies of the ignition system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also on the wiring harness (e.g. tachometer connection, diagnostic plug), at plug-in connections and test equipment.

For production reasons:  
continued on the following  
coordinate.



High-voltage symbols: Danger, 400 V ... 25 kV

- 1 = EI-K control-unit plug
- 2 = Electric-fuel-pump relay
- 3 = Ground (intake manifold, rear)
- 4 = Characteristic-map change-over
- 5 = Ignition coil
- 6 = Knock sensor
- 7 = Magnetic pulse generator
- 8 = Angle-of-rotation sensor
- 9 = Fault lamp (self-diagnosis)

- 10 = Self-diagnosis switch
- 11 = Trigger box
- 12 = Charge-air-press. tim. valve
- 13 = Ground (valve cover, right, near to auxiliary-air device)
- 14 = KE-Jetronic control unit
- 15 = Idle throttle-valve switch
- 16 = Ignition and starting switch
- 17 = Battery

The dangerous locations are marked with high-voltage symbols taking the example of the terminal diagram of an electronic ignition system.



- \* When testing the compression, disconnect the trigger-box plug or firmly connect ignition coil term.4 to ground using an auxiliary cable (dangerous voltages, insulation damage at ignition coil, ignition distributor, ignition harness).

#### N O T E

The auxiliary cable must be interference-suppressed with at least 2 k  $\Omega$  , e.g. with sleeve-type suppressor (5 k  $\Omega$  ) 0 356 500 001.

- \* Do not provide starting aid using more than 16 V or a fast charger.
- \* Do not disconnect or connect the wiring-harness plug from the trigger boxes or control units when the ignition is switched on.
- \* Make resistance measurements only when the ignition is switched off or the battery is disconnected (tester defective).
- \* The specified ignition coil (see Part No.) must not be replaced by a different ignition coil.
- \* A suppression capacitor must not be connected to ignition coil term.1.
- \* Ignition coil term.1 must not be applied to ground as an anti-theft measure (ignition coil is destroyed when "ignition ON").
- \* The battery + or a test lamp must not be connected to ignition coil term.1 (trigger box is destroyed).

- \* H.T. ignition lead from ignition coil term.4 to ignition distributor term.4 must not be disconnected during operation.
- \* There must be no arcing from ignition coil term.4 to ignition coil term.1 and term.15. EI-K control unit and trigger box may be destroyed.
- \* In order to prevent the trigger box from being destroyed, the secondary side of the ignition system must have at least 2 k  $\Omega$  interference suppression, whereby the original distributor rotor with 1 k  $\Omega$  interference-suppression resistor must be fitted.
- \* No external voltage, e.g. ohmmeter, may be connected to the magnetic pulse generator (Hall generator). Caution when switching measuring ranges!
- \* The lines from the magnetic pulse generator to the EI-K control unit must be screened (negative effect on operation of EI-K control unit).
- \* Arcing or breakdown of insulation on the distributor cap (poor insulation) may lead to the destruction of the magnetic pulse generator and EI-K control unit.
- \* Do not disconnect the battery with the engine running.
- \* If the battery is connected up incorrectly (mix-up of plus sign and minus sign) the magnetic pulse generator, trigger box, ignition coil and EI-K control unit are destroyed.

- \* The knock sensor lead must be screened and laid separately from high-voltage cables.
- \* Install the knock sensor fastening screw without plain washer, spring lock washer, tooth lock washer etc. Secure the fastening screw only with locking paint.
- \* Incorrect indication of engine speed, dwell angle and ignition point:  
In the case of ignition systems with trigger box 0 227 100 111 with current limitation, incorrect indication of engine speed, dwell angle and ignition point on testers may occur.

For more detailed information, see Coordinates N15 ... N22

TEST EQUIPMENT AND TOOLS

Motortester e.g.	MOT 201	0 684 000 201
Pulse shaper (required for measuring the primary voltage with MOT 201, 202 and 400)		1 684 463 154
Sleeve-type suppressor 5 k $\Omega$		0 356 500 001
Voltmeter with R $\geq$ 100 k $\Omega$ and resolution of 10 mV or digital multimeter with R $\geq$ 100 k $\Omega$ and resolution of 10 mV	MOT 201 MOT 300 ETE 014.00	0 684 000 201 0 684 000 300 0 684 101 400 commercially available
Ohmmeter or e.g.	ETE 014.00 Pontavi WH2	0 684 101 400 Commercially available
Thermal conduction compound		5 942 860 003
Screw locking paint	30 g	5 703 245 003
Torque wrench Range 5...60 Nm		Commercially available
Test leads (for proper connection of testers to connectors) Test prod, black Test prod, red (for proper connection of testers to connectors)		KDZS 0004 and KDZS 0005 1 684 485 034 1 684 485 035

Auxiliary lead for self-fabrication (for  
bridging the idle throttle-valve switch)

Required parts:

approx. 100 mm cable 2.5 mm 2

Blade terminal, 2 pieces

8 784 480 011

For production reasons:  
continued on the following  
coordinate.

## INSTALLATION POSITION OF COMPONENTS

The EI-K control unit is positioned in the front of the passenger compartment on the right. See upper illustration.

### Note on removal:

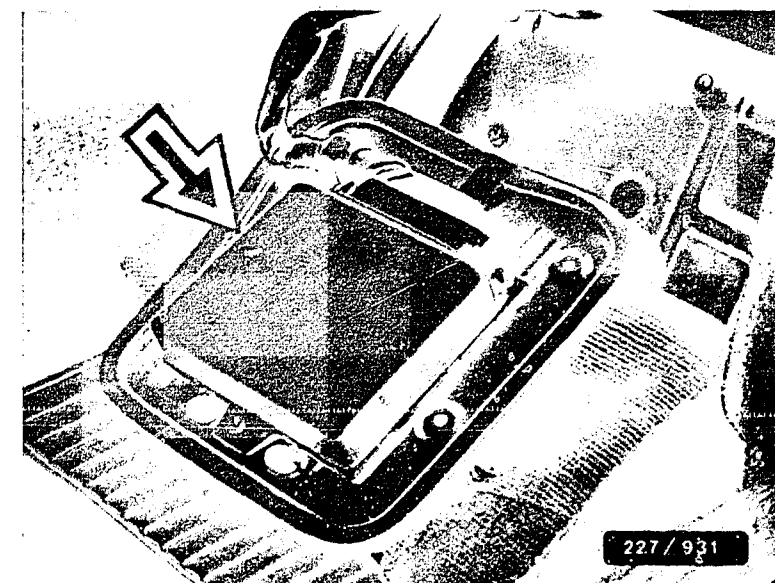
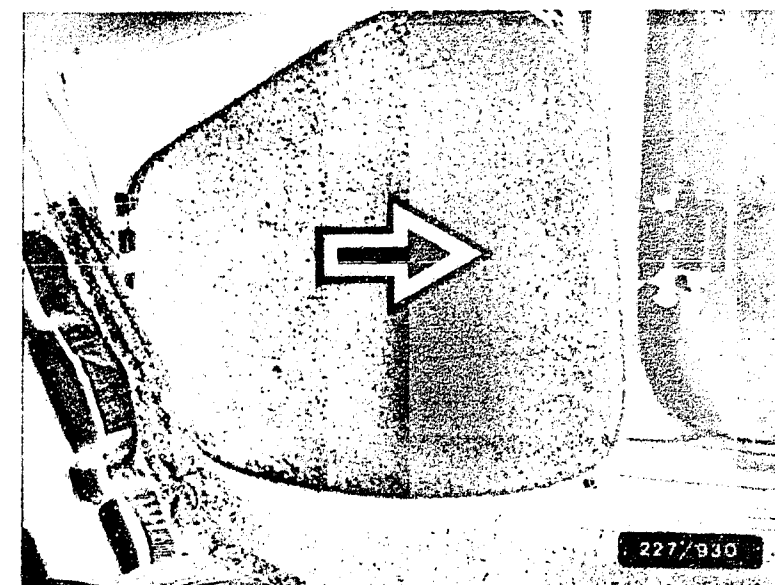
Pull EI-K control-unit covering in direction of arrow (plug-in connection). See center illustration.

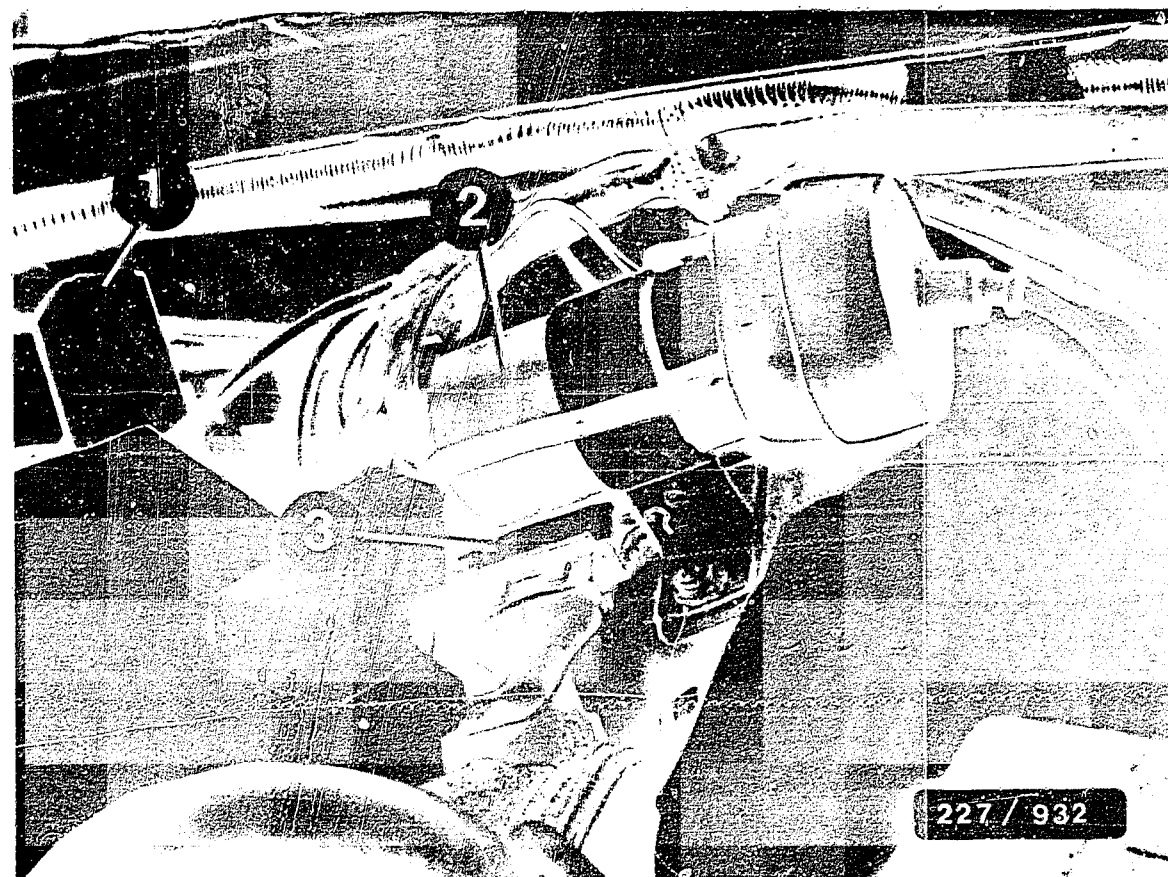
After screwing off the fastening screw (upper illustration, arrow), pull EI-K control unit in direction of arrow (plug-in connection).

The LE-Jetronic control unit is positioned in the footwell on the passenger side. See lower illustration:

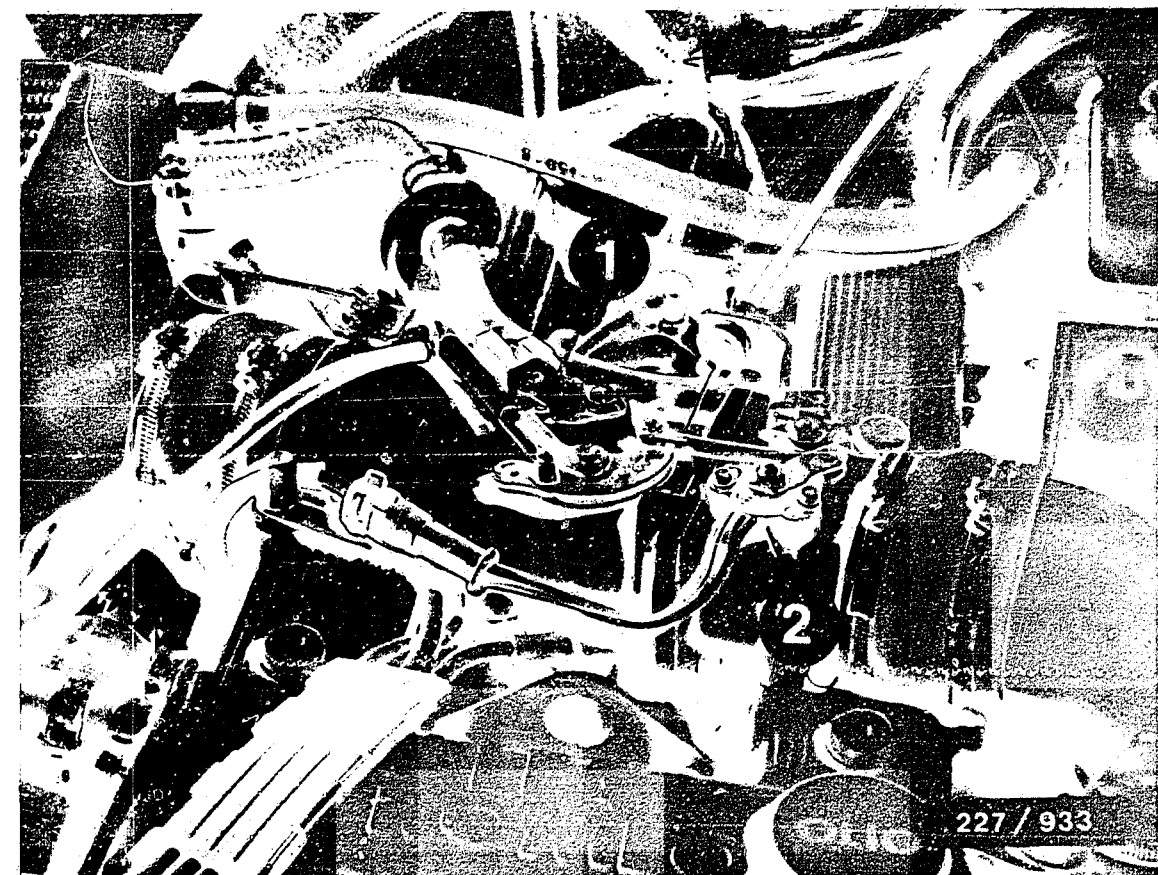
### Note on removal:

Lift up and fold back the floor mat.  
Unscrew fastening screws (not in picture) from floor pan.





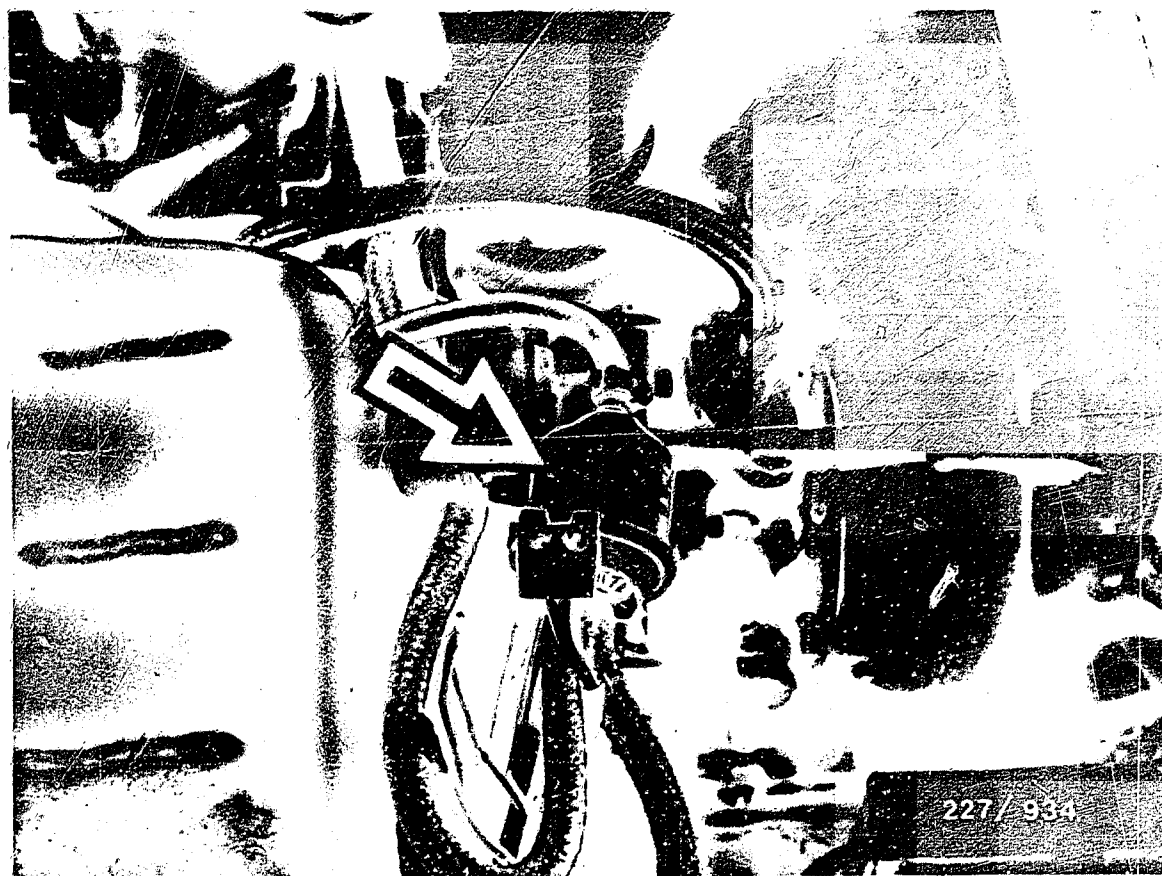
- 1 = Electric-fuel-pump relay
- 2 = Ignition coil
- 3 = Trigger box



- 1 = Idle throttle-valve switch
- 2 = Angle-of-rotation sensor

Note on removal:

Remove plastic covering (not in picture).



Arrow = Charge-air-pressure timing valve



Arrow = Knock sensor

Knock sensor is positioned close to the starting motor.

#### N o t e:

Install knock sensor retaining nut w i t h o u t plain washer, spring lock washer, tooth lock washer etc.

Secure fastening screw only with locking paint.



The self-diagnosis switch together with the fault lamp are positioned in the instrument panel.

**Note:**

Self-diagnosis is activated via the self-diagnosis switch (upper illustration, Item 1).

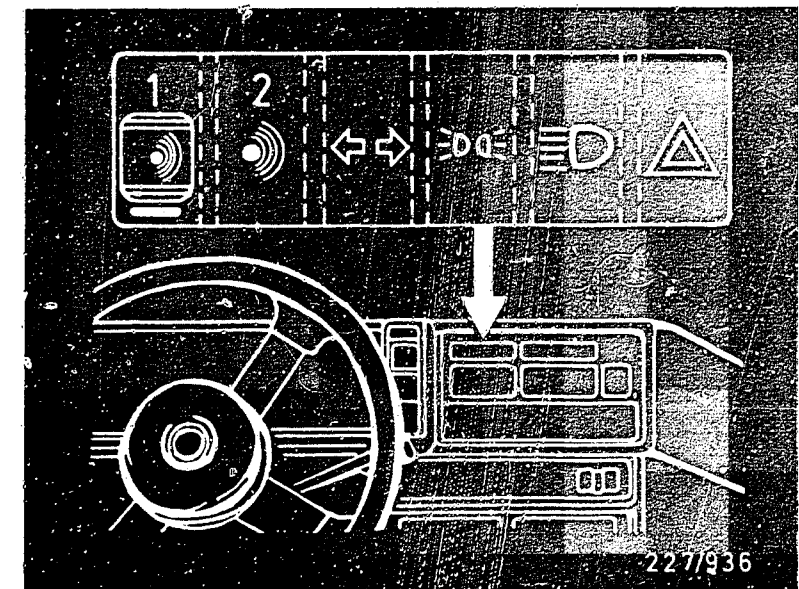
**Note on removal:**

Remove ashtray insert.

Unscrew fastening screws from instrument panel.  
See lower illustration, arrows.

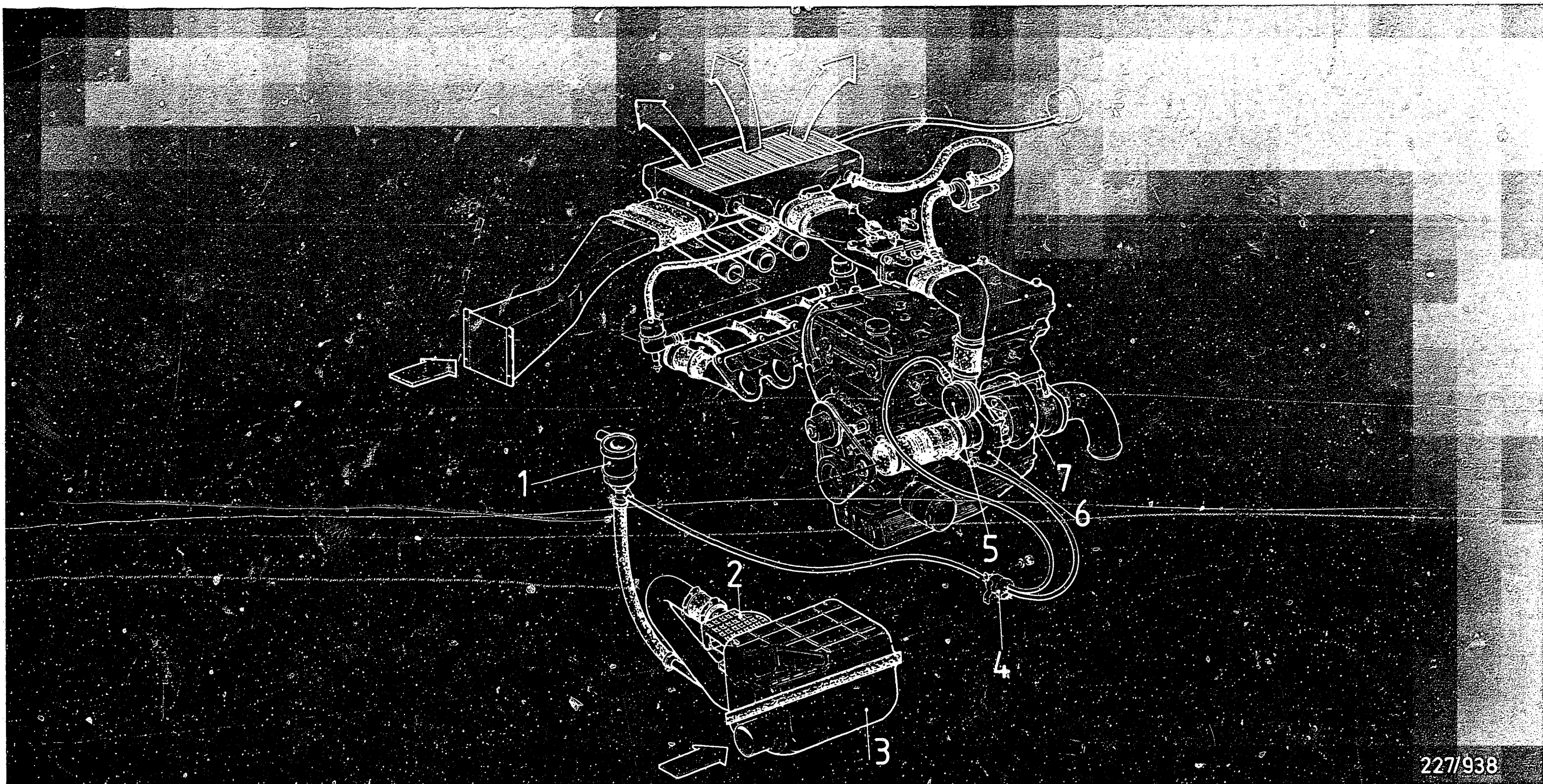
Insert screwdriver between dashboard and instrument panel.  
Lower illustration, arrows.

Push the screwdriver lightly downwards and at the same time pivot instrument panel backwards.



Arrow = Instrument panel  
1 = Self-diagnosis switch  
2 = Fault lamp





227/938

# DIAGRAM OF AIR LINES

- 1 = Oil-lamp vapor separator
- 2 = Air-flow sensor
- 3 = Air filter
- 4 = Charge-air-pressure timing valve

- 5 = Overpressure valve
- 6 = Compressor
- 7 = Turbine

## TROUBLE-SHOOTING

Procedure for self-diagnosis, self-diagnosis test chart and trouble-shooting program.

Installed in this vehicle is an EI-K control unit which has a self-diagnosis feature (knock control only).

Therefore, in the case of any test - as long as the engine is running - the first thing to check is the self-diagnosis feature.

Activation of the self-diagnosis feature is described in coordinate B09.

The self-diagnosis test chart beginning at coordinate B11 contains fault indications (consisting of flashing codes), tests of components/operation, test instructions/test conditions, terminal and set-value details, as well as coordinate details for trouble-shooting/trouble elimination in the following self-diagnosis trouble-shooting program.

The self-diagnosis trouble-shooting program as of coordinate B15 is divided into 3 rows of boxes.

The left-hand row contains test instructions and set values.

The center row contains further test instructions and repair instructions.

The right-hand row contains the illustrations/terminal diagrams belonging to the text and the explanation of the items in the illustration.

If the questions asked in the left-hand row can be answered conclusively with "yes", return to self-diagnosis coordinate B11 at the end of the test step.

If the answer to the question is "no", branch off to the center row and carry out the tests given there. At the end of the test, return to self-diagnosis coordinate B11.

If the self-diagnosis feature indicates no more fault and the customer complaint is still not eliminated continue trouble-shooting following the trouble-shooting chart starting at coordinate B03 or the trouble-shooting program as of coordinate C07.

### Procedures for trouble-shooting chart

The trouble-shooting chart starting at coordinate B04 contains customer complaints (symptom of trouble), causes of the trouble (component fault) and coordinate details.

Select the possible cause of the trouble (component fault) in the trouble-shooting chart in accordance with the customer complaint (symptom of trouble).

In order to avoid any incorrect measurements, the possible causes of the trouble (component faults) must be checked IN SEQUENCE from the TOP to the BOTTOM (because of the interlinking of test steps). If there are no coordinate details, the causes (component faults) are such that no test instructions are necessary.

If the customer complaint is detected in accordance with the trouble-shooting chart, detailed trouble-shooting is possible via the coordinate details.

If the customer complaint is unclear from the trouble-shooting chart, check for all the causes (component faults) listed in the trouble-shooting chart.

If the customer complaint is still not eliminated after checking for all the possible causes (component faults), TRY installing a new, specified ignition coil and/or trigger box.

N o t e:

Further possible faults may exist in the fuel system or the engine may be mechanically not O.K.

## Procedure for trouble-shooting program

The trouble-shooting program starting on Coordinate C07 is divided into 3 rows of boxes and contains causes of trouble (component faults) which are not covered by self-diagnosis.

The left-hand row contains test instructions and set values.

The center row contains further test instructions and repair instructions.

The right-hand row contains the illustrations referred to in the text and the explanation of the items illustrated.

If the questions asked in the left-hand column can be answered conclusively with "yes", return at the end of the test step to the troubleshooting chart Coordinate B04 or complete the test step in accordance with "continued on next microcard".

If the answer to the question is "no", branch off to the center row and carry out the tests given there.

When testing is completed, return to the troubleshooting chart Coordinate B04

## Test requirements

Battery fully charged, fuel system O.K., engine mechanically O.K. (e.g. compression, valve clearance etc.).

Ambient temperature/ignition system temperature  
0° to 100° C (temperature has a considerable  
effect on measured values).

## TROUBLE-SHOOTING CHART

Customer complaint (symptoms of trouble)

1. Starting motor operates, but engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Rough idling (engine speed, exhaust gas).
4. Poor throttle response, progression fault.
5. Misfiring (ignition, injection).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine diesels.
9. Engine pings/knocks.
10. Engine overheats.
11. Fault lamp.

										Cause (component fault)	Coord
										* Self-diagnosis	B07
*		*	*	*						High-voltage side	C07
*		*	*	*						Ignition coil	C09
*										Firing sequence	—
*										Voltage, trigger box	C11
*										Voltage, primary circuit	C13
*										Voltage, EI-K control unit	C15
*										Ignition-distributor plug and socket	C17
*										Voltage, magnetic pulse generator	C19
*										Magnetic pulse generator operation	C21
*										EI-K control unit operation	C23
*										Ignition-distributor assembly adjustment	C27

## TROUBLE-SHOOTING CHART

Customer complaint (symptoms of trouble)

1. Starting motor operates, but engine fails to start or starts only with difficulty
2. Engine starts, but then dies.
3. Rough idling (engine speed, exhaust gas).
4. Poor throttle response, progression fault.
5. Misfiring (ignition, injection).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine diesels.
9. Engine pings/knocks.
10. Engine overheats.
11. Fault lamp.

										Cause (component fault)	Coord.
*										Speed signal (Jetronic)	D01
*			*							Contact resistances	D03
								*		Fault lamp	D05
	*	*		*	*					Throttle-valve switch - idle	D09
	*	*		*	*		*	*	*	Basic ignition setting	D15
				*	*			*		Fuel enrichment	D17
		*		*	*		*	*		Charge-air-pressure timing valve	D21
			*							Voltage, trigger box	D23
			*							Voltage, ignition coil	D25
			*							Primary voltage	D27

For production reasons:  
continued on the following  
coordingate.

## SELF-DIAGNOSIS

### Test requirement

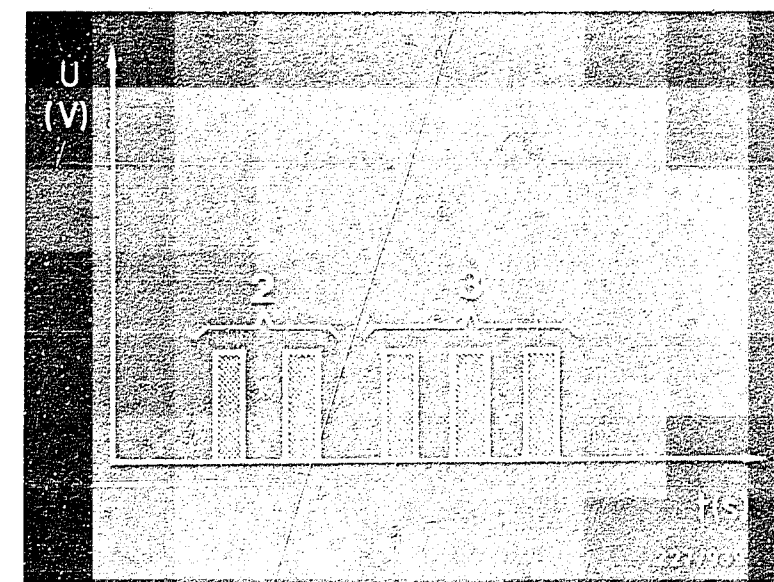
Fault lamp must be lit when ignition "ON".  
Engine turns over at at least 4000 min<sup>-1</sup>.

### General

The EI-K control unit has a self-diagnosis function in the form of a flashing code. This self-diagnosis function indicates only one fault at a time. If more than one fault is present, the fault which takes the highest priority is indicated. To be able to request further faults, the fault detected initially must be eliminated.

### Evaluating the flashing code

The flashing code consists of 2 flashing-pulse groups. There is a pause between the flashing pulse groups (fault lamp "OFF"). After the 2 flashing-pulse groups are transmitted, there is a pause (fault lamp "OFF"). The illustration shows as an example of the flashing code 2 3. The diagnosis cycle including the pauses are repeated until the ignition is switched off. With that, the fault stored in the EI-K control unit is cleared as well.



NOTE: Gridded field means  
fault lamp "ON"



## Activating the self-diagnosis

Switch on ignition.

Switch on self-diagnosis switch on instrument panel.  
Fault lamp must light up. See illustration.

If fault lamp does not light up, then perform Coordinate D05.

Afterwards, continue activation in accordance with Coordinate B09.

Start engine and run for at least 10 seconds at at least  
 $4000 \text{ min}^{-1}$ .

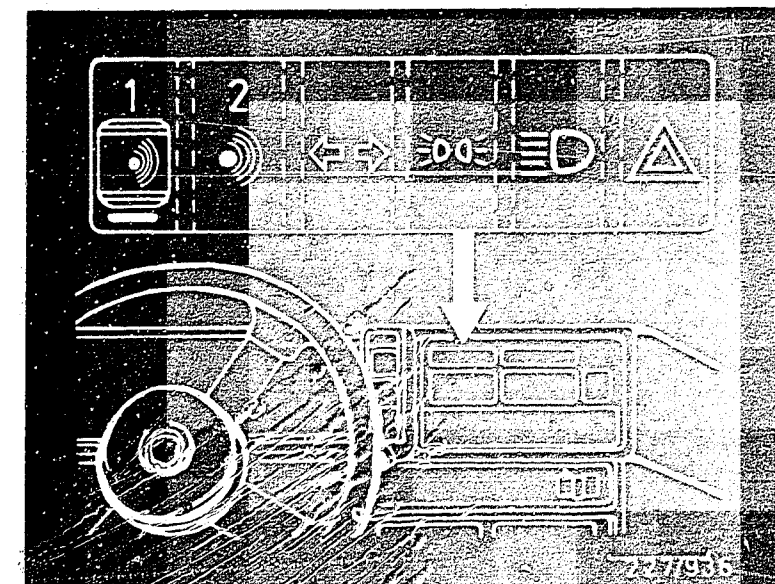
If a fault is detected, fault lamp lights constantly at greater  
than  $1550 \text{ min}^{-1}$ .

Afterwards, run engine at idle (not above  $1550 \text{ min}^{-1}$ ).

The fault lamp flashes with a different sequence for each  
different fault.

With the aid of the self-diagnosis test chart, the flashing code  
may be evaluated and the fault remedied.

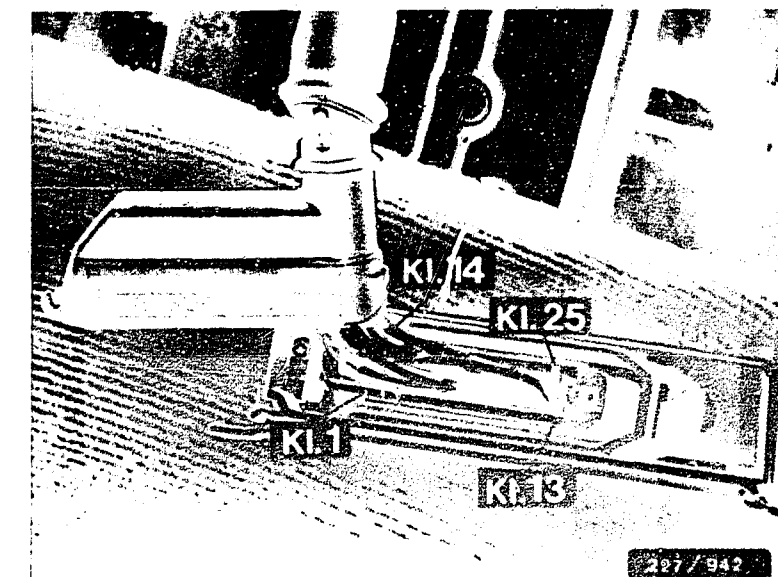
Self-diagnosis activation together with the following fault  
elimination must be repeated until the fault lamp no longer  
flashes (knock control is then O.K.).



Arrow = Instrument panel  
1 = Self-diagnosis switch  
2 = Fault lamp

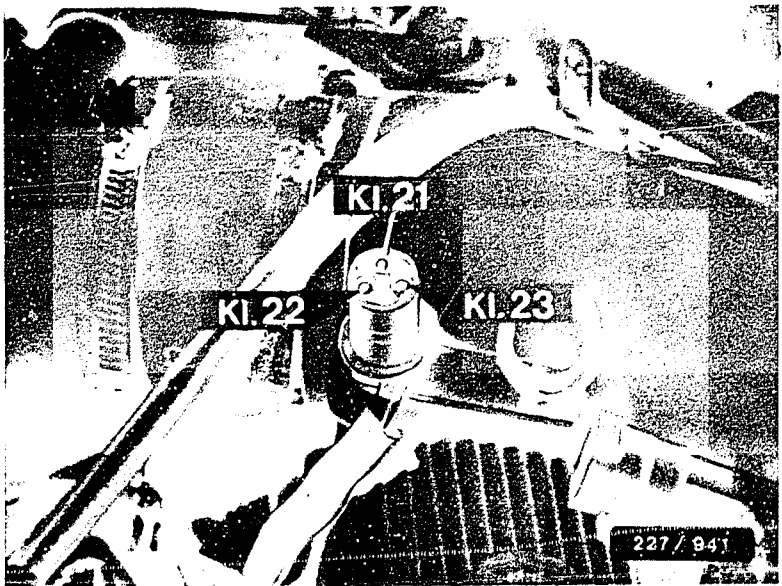
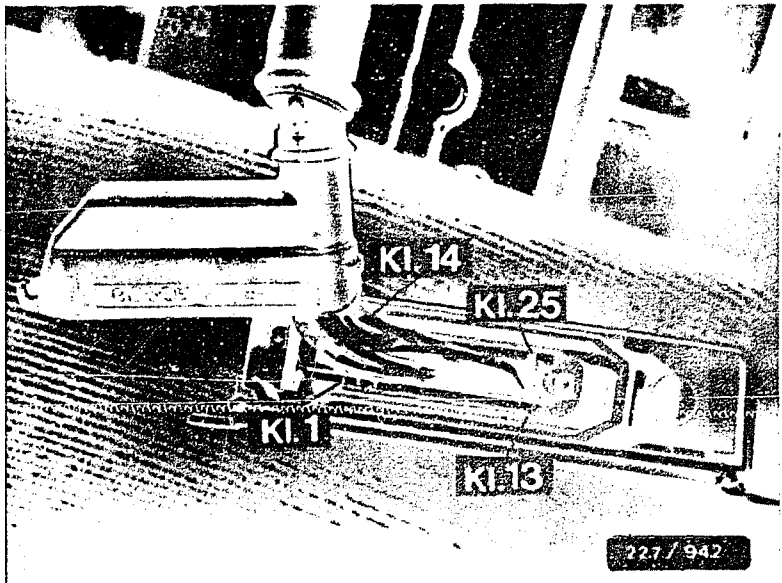
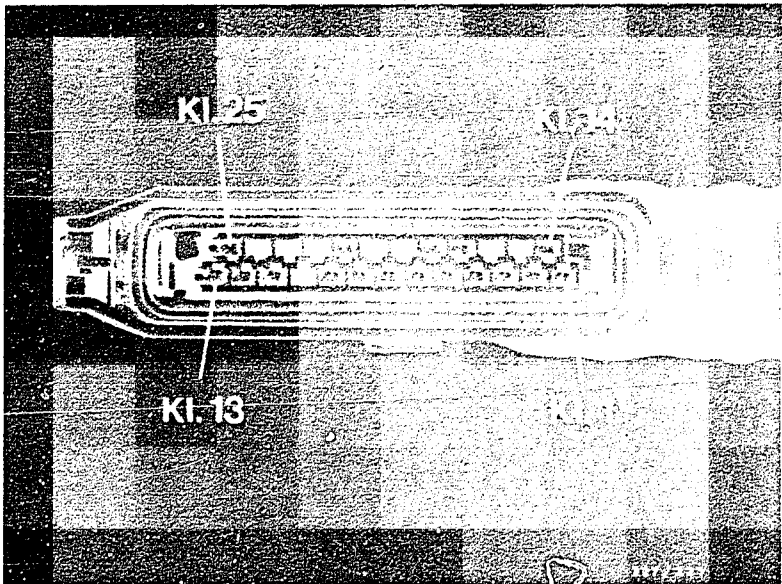
# SELF-DIAGNOSIS TEST CHART

Fault indic. Flashing code	Testing of components/function Test instructions/conditions	Term- inals	Set values	Coord- inates
1 1	MAXIMUM RETARDATION OF KNOCK CONTROL Octane rating of fuel too low. Test valve clearance, pressure relief valve of exhaust turbo-supercharger, fuel-injection sys. Main-bearing damage, abnormal engine noises.	—	—	—
1 2	VOLTAGE SUPPLY, EI-K CONTROL UNIT. Engine at idle. Voltage, EI-K control-unit plug with handle cover removed. See illustration.	6 20 (+) (-)	See brief instruc.	B15
2 1 / 2 2	KNOCK SENSOR Visual examination, knock sensor plug for oxidation. Resistance, EI-K control-unit plug. Tightening torque.	12 13	See brief instruc. See brief instruc.	B17
2 3	EI-K CONTROL UNIT, EVALUATION CIRCUIT Replace EI-K control unit.	—	—	—
3 1	LOAD SIGNAL Engine at idle. Dwell angle, EI-K control-unit plug with handle cover removed. See illustration. Read off dwell angle. Briefly apply full throttle. Read off dwell angle.	8 B- (+) (-)	Noticeable dwell-angle change.	B23



SELF-DIAGNOSIS TEST CHART

Fault indic. flashing code	Testing of components/function Test instructions/conditions	Term- inals	Set values	Coord- inates
4 1	<p>ANGLE-OF-ROTATION SENSOR (input voltage too low) Pull off EI-K control-unit plug, pull apart angle-of-rotation-sensor plug connection.</p> <p>1.Voltage, battery and EI-K control-unit plug. See upper ill.</p> <p>2.Connect up angle-of-rotation-sensor plug. Ignition ON. Voltage EI-K control-unit plug (connected) with handle cover removed. See center ill.</p> <p>3.Voltage, EI-K control-unit plug. The voltage measured under point 2 multiplied by 0.21 corresponds to set value; if necessary, angle-of-rotation sensor.</p> <p>Note: use only voltmeter with R<sub>i</sub> greater than 100 k <math>\Omega</math> and resolution of 10 mV under points 2 and 3.</p>	<p>B+ 22 (+) (-)</p> <p>21 23 (+) (-)</p> <p>22 23 (+) (-)</p>	<p>0 V</p> <p>See brief instruc.</p> <p>See brief instruc.</p>	B25
4 2	<p>ANGLE-OF-ROTATION SENSOR (input voltage too high). Resistance, EI-K control-unit plug. See upper illustration.</p> <p>Pull apart angle-of-rotation-sensor plug connection.</p> <p>Ignition ON. Voltage, angle-of-rotation-sensor plug. See lower illustration.</p>	<p>21 22</p> <p>22 B- (+) (-)</p>	<p>See brief instruc.</p> <p>0 V</p>	C03



# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 1 )

Flashing code 1 2

Test voltage supply of EI-K control unit.

Switch off ignition.

Pull off EI-K control-unit plug and push back handle cover after unscrewing the fastening screws and removing the rubber seal.

Connect EI-K control-unit plug and connect voltmeter to term.6 (+) and term.20 (-).

Run engine at idle.

Set value: equal to/greater than 10.5 V.

Is set value obtained?

N>

Connect voltmeter (+) to positive battery terminal and EI-K control-unit plug term.6 (-).

Run engine at idle.

Voltage drop. max. 0.5 V

Eliminate voltage drop.

Connect voltmeter (-) to negative battery terminal and EI-K control-unit plug term.20 (+).

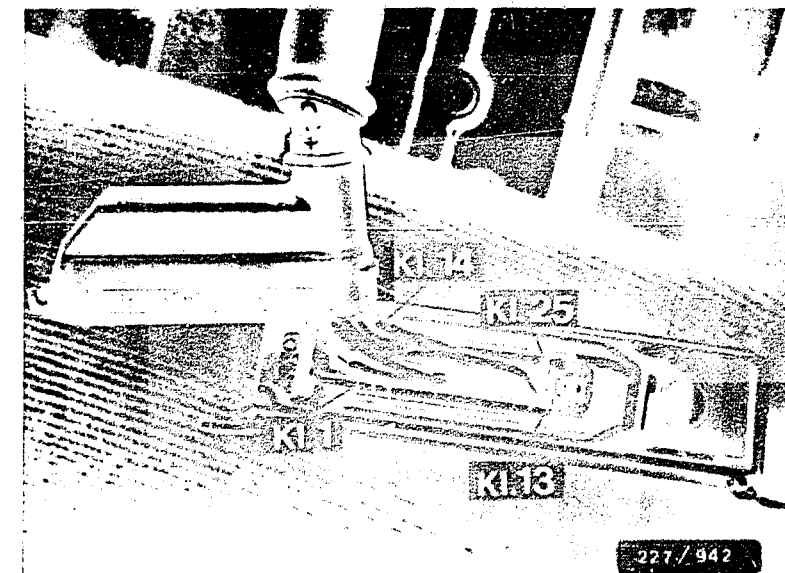
Run engine at idle.

Voltage drop max. 0.5 V.

Eliminate voltage drop.

Replace EI-K control unit.

Return to self-diagnosis B09



# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 2 )

Flashing code 2 1 / 2 2

Test knock sensor.

Visual examination

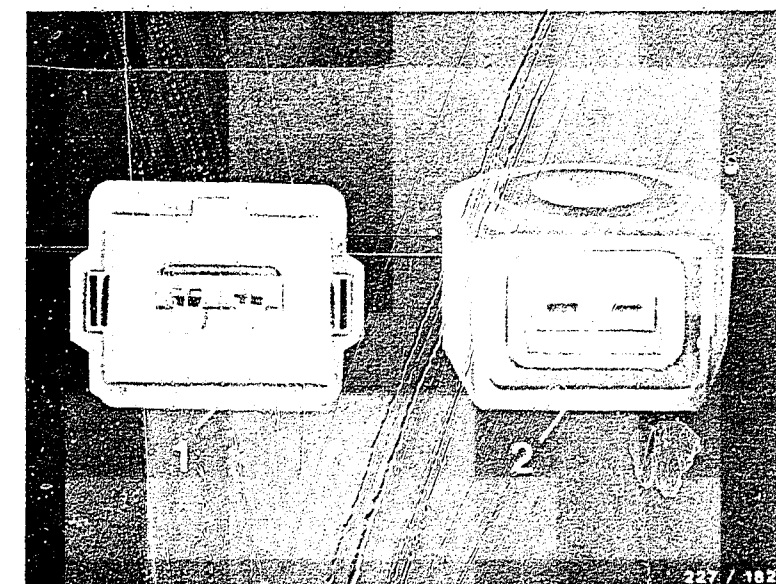
Pull off knock-sensor plug.

Test contacts of knock-sensor plug and socket (upper illustration, items 1 and 2) for oxidation.

Visual examination O.K.?

N>

Eliminate oxidation.



Switch off ignition.

Pull off EI-K control-unit plug.

Connect ohmmeter to:

Knock-sensor plug (center ill.)	EI-K control-unit plug. (lower ill.)
------------------------------------	-----------------------------------------

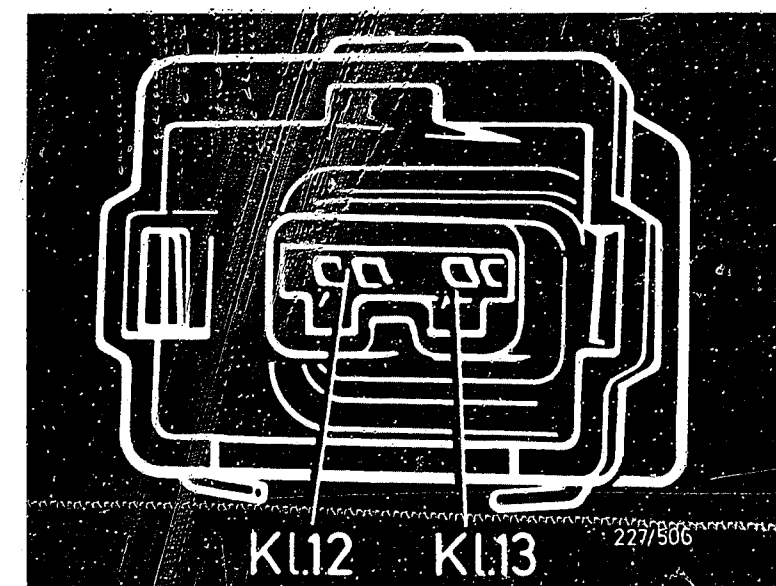
Term.12	term.12
Term.13	term.13

Set value: approx. 0  $\Omega$   
(continuity)

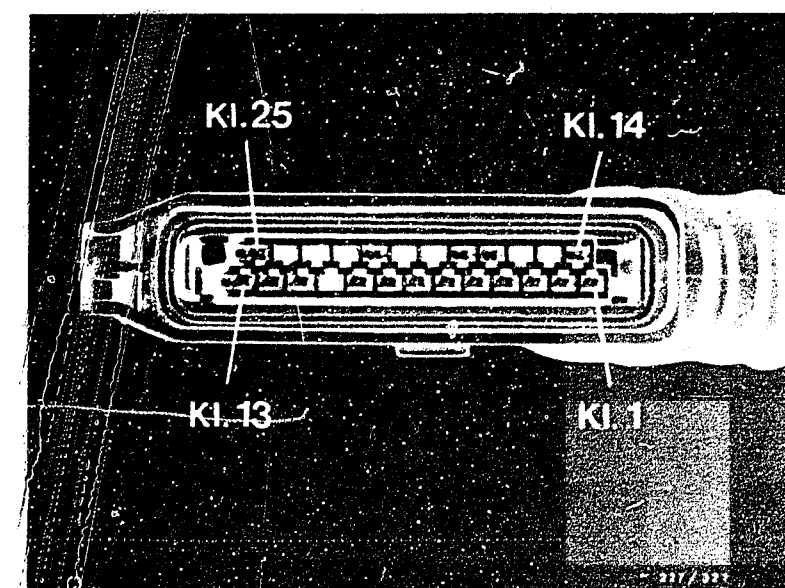
Is set value obtained?

N>

Eliminate open circuit.



Continued on next picture page



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 2 ) CONTINUED ( 1 )

Y  
Connect ohmmeter to knock-sensor  
plug term.12 and term.13.

Set value: infinite  $\Omega$   
(open circuit)

Is set value obtained?

N>

If ohmmeter indicates approx.  
0  $\Omega$  (continuity), eliminate  
short circuit to ground from  
knock-sensor lead term.13 to  
term.12.

Y

Y  
Connect knock-sensor  
plug.

Connect ohmmeter to EI-K control-  
unit plug term.12 and term.13.

Set value: see brief instructions.

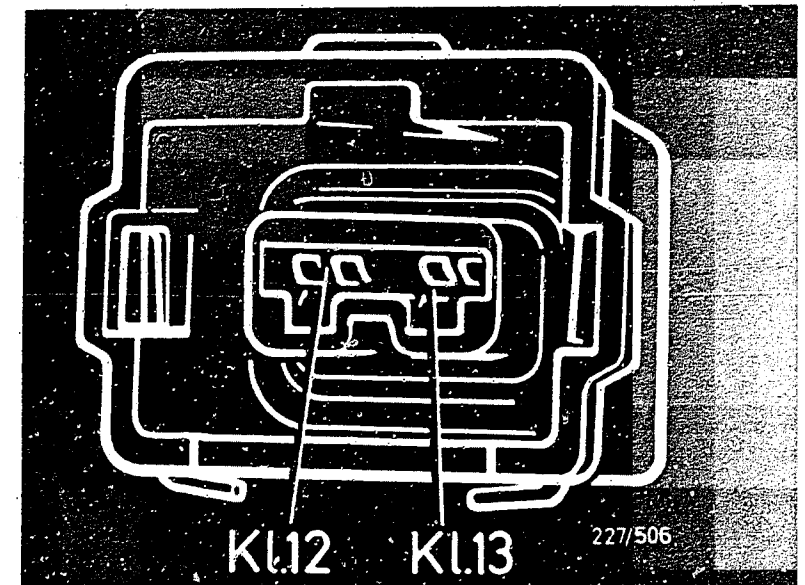
Is set value obtained?

N>

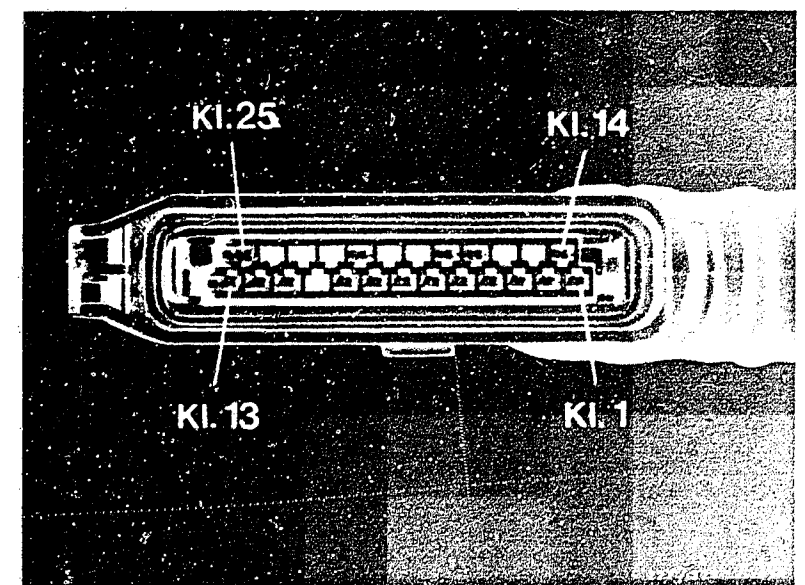
Replace knock sensor.

Y

Continued on next picture page



Knock-sensor plug



EI-K control-unit plug



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 2 ) CONTINUED ( 2 )

Test tightening torque of knock-sensor fastening screw.

Set value: see brief instructions.

Is set value obtained?

Tighten to specified tightening torque.

Replace knock sensor.

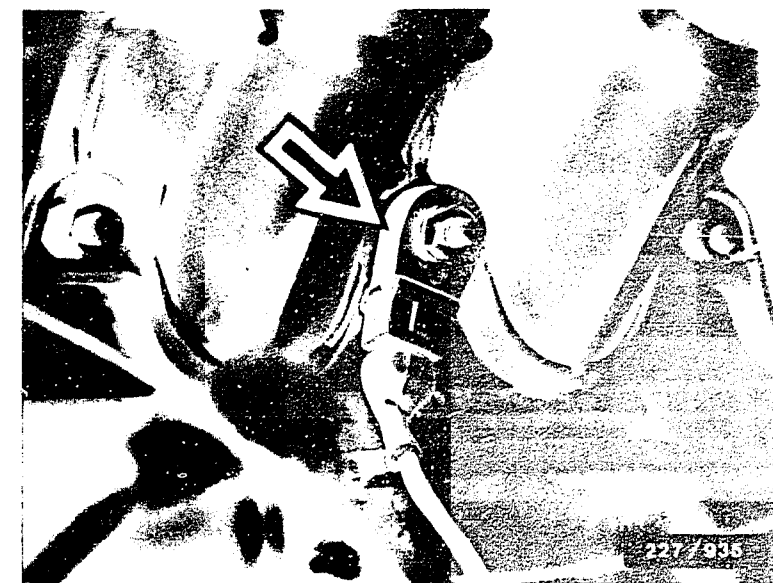
Activate self diagnosis.

"Old" knock sensor is defective if fault lamp now no longer indicates the flashing code 2 1/2 2.

Self diagnosis O.K.?

Reinstall "old" knock sensor and replace EI-K control unit.

Return to self-diagnosis B09



Arrow = Knock sensor

# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 3 )

Flashing code 3 1

Test load signal.

Switch off ignition.

Pull off EI-K control-unit plug and push back handle cover after unscrewing the fastening screws and removing the rubber seal.

Connect EI-K control-unit plug. See upper illustration.

Connect dwell-angle tester to EI-K control-unit plug term.8 (+) and to vehicle ground.

Run engine at idle.

Read off and note dwell-angle value.

Briefly apply full throttle and observe dwell-angle indicator.

The previously indicated dwell angle must noticeably change.

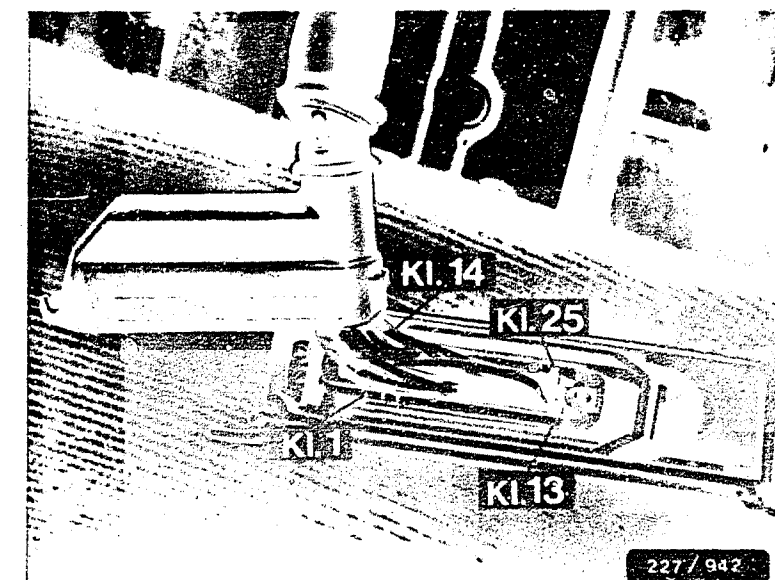
Has the dwell angle change?

N>

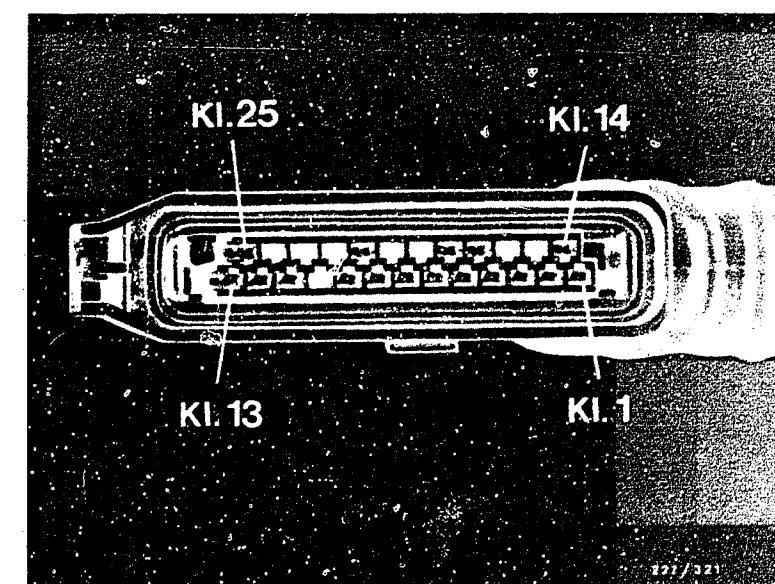
Test lead from EI-K control-unit plug term.8 to Jetronic control-unit plug term.6 for open circuit and short circuit to ground.

Eliminate open circuit and/or short circuit to ground.

If open circuit and/or short circuit to ground not present, replace Jetronic control unit.



EI-K control-unit plug



Return to self-diagnosis B09

# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 4 )

Flashing code 4 1

Test angle-of-rotation sensor  
(input voltage too low).

Switch off ignition.

Pull off EI-K control-unit plug  
(upper illustration), pull apart  
angle-of-rotation-sensor plug  
connection (lower illustration).

Connect voltmeter to positive  
battery terminal and angle-of-  
rotation-sensor plug term.22 (-).

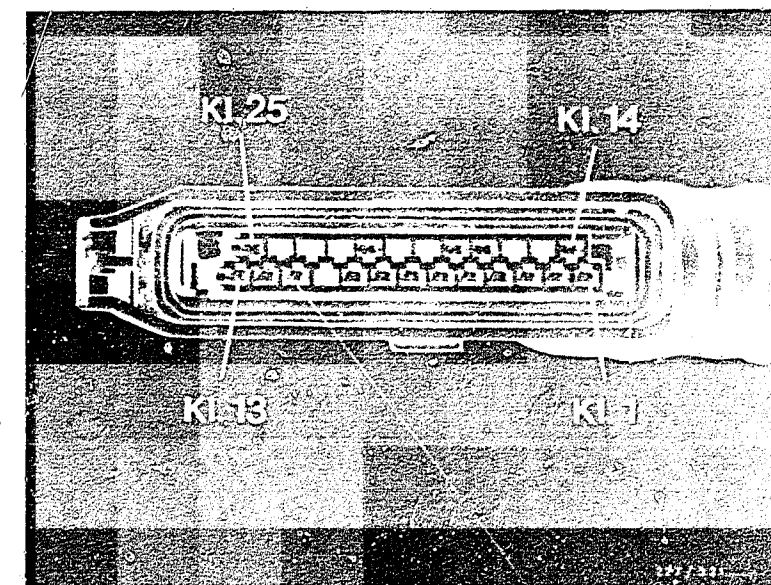
Set value: 0 V

Is set value obtained?

N>

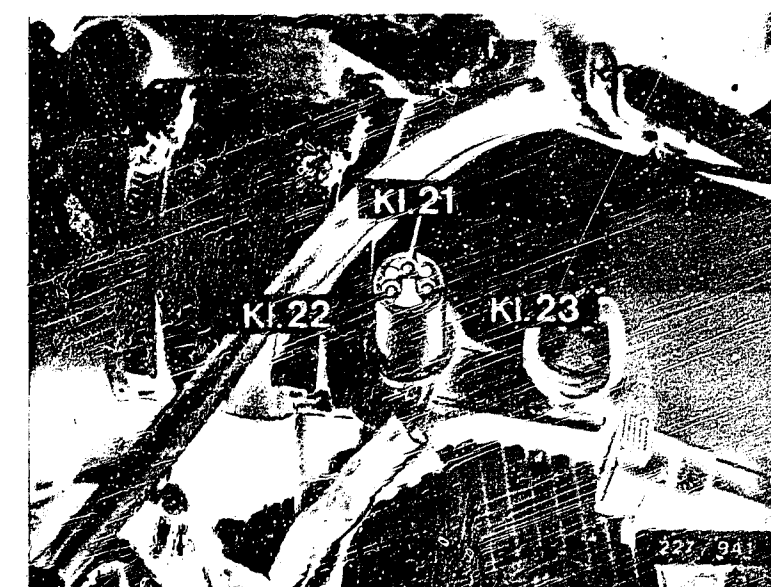
If voltage was indicated, lead  
from angle-of-rotation-sensor  
plug term.22 to EI-K control-  
unit plug term.22 has short  
circuit to ground.

Eliminate short circuit to ground.



EI-K control-unit plug

Angle-of-rotation-sensor plug  
connection



Continued on next picture page

V

For the following measurement, only a voltmeter with internal resistance  $R_i$  equal to/greater than  $100\text{ k } \Omega$  and resolution of  $10\text{ mV}$  may be used.

Connect up angle-of-rotation-sensor plug. See upper ill.

Push back handle cover on disconnected EI-K control-unit plug after unscrewing the fastening screw and removing the rubber seal.

Connect EI-K control-unit plug. See lower illustration.

Connect voltmeter to EI-K control-unit plug term.21 (+) and term.23 (-).

Switch on ignition.

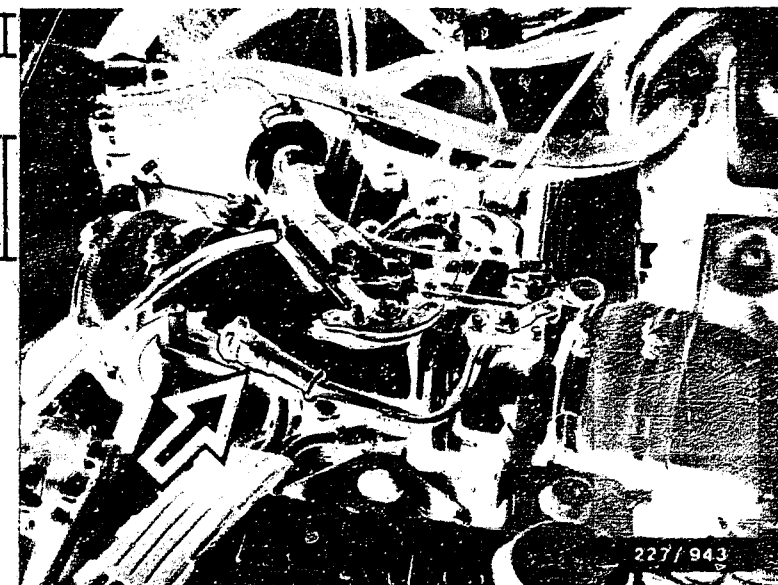
Set value: see brief instructions.

Note down voltage value.

Is set value obtained?

N>

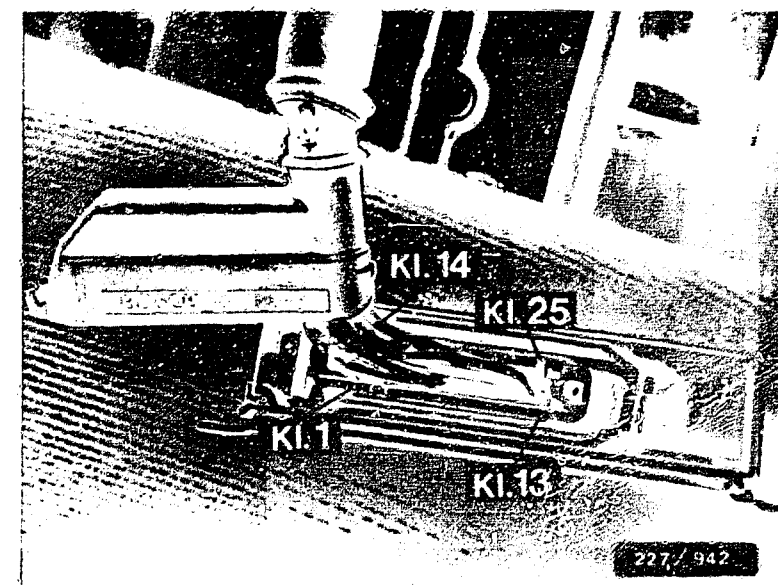
Replace EI-K control unit.



Arrow = Angle-of-rotation-sensor plug

V

Continued on next picture page



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 4) CONTINUED ( 2)

Switch off ignition.

Connect voltmeter to EI-K control-unit plug term.22 (+) and term.23 (-).

Multiply the voltage value noted beforehand by 0.21. Calculated voltage corresponds to set value.

Switch on ignition.

Actual value must agree with set value (including 2nd place after the point).

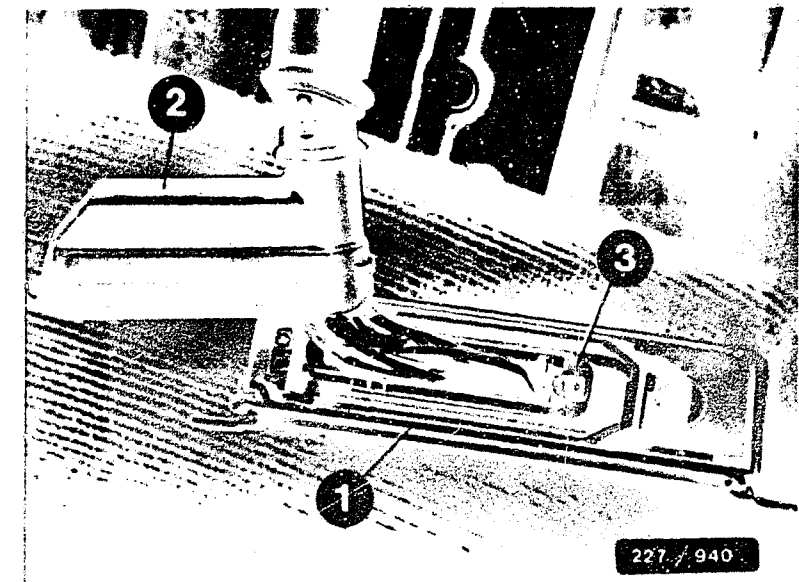
Is set value obtained?

N>

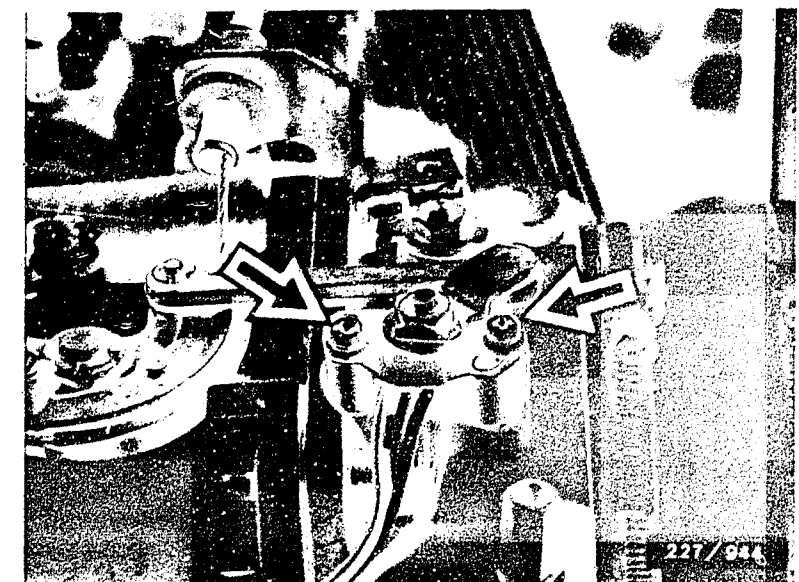
Adjust angle-of-rotation sensor:

Throttle valve is in idle position.

Slightly loosen fastening screws of angle-of-rotation sensor (lower illustration, arrow) and turn angle-of-rotation sensor until the previously calculated voltage is indicated at the voltmeter. Tighten fastening screws.



EI-K control-unit plug



Return to self-diagnosis B09

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 5)

Flashing code 4 2

Test angle-of-rotation sensor  
(input voltage too high).

Switch off ignition.

Pull off EI-K control-unit plug  
and connect ohmmeter to term.21  
and term.23. See upper  
illustration.

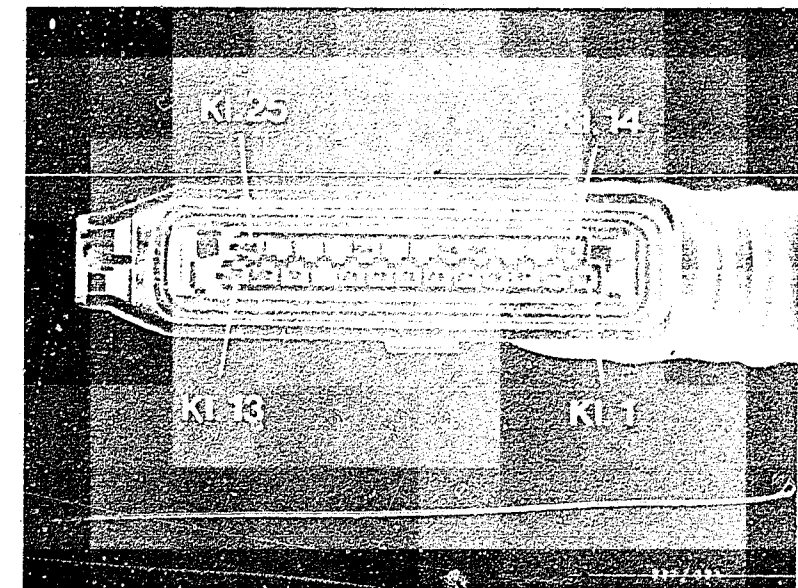
Set value: see brief instructions.

Is set value obtained?

N>

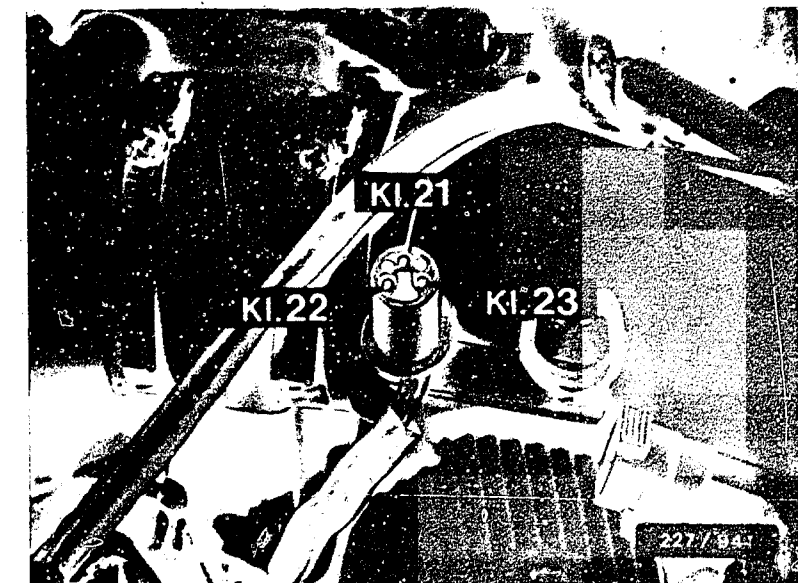
Pull apart plug connection of  
angle-of-rotation sensor (lower  
illustration) and test lead from  
angle-of-rotation-sensor plug  
term.21 and term.23 to EI-K  
control-unit plug term.21 and  
term.23 for open circuit.

Eliminate open circuit.



EI-K control-unit plug

Angle-of-rotation-sensor plug  
connection



Continued on next picture page



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 5) CONTINUED ( 1)

Pull apart angle-of-rotation-  
sensor plug connection.  
See lower illustration.

Connect voltmeter to angle-of-  
rotation-sensor plug term.22 (+)  
and to vehicle ground (-).

Switch on ignition.

Set value: 0 V

Is set value obtained?

N>

If voltage was indicated, lead  
from angle-of-rotation-sensor  
plug term.22 to EI-K control-  
unit plug term.22 is connected  
to positive battery terminal  
and/or to term.21.

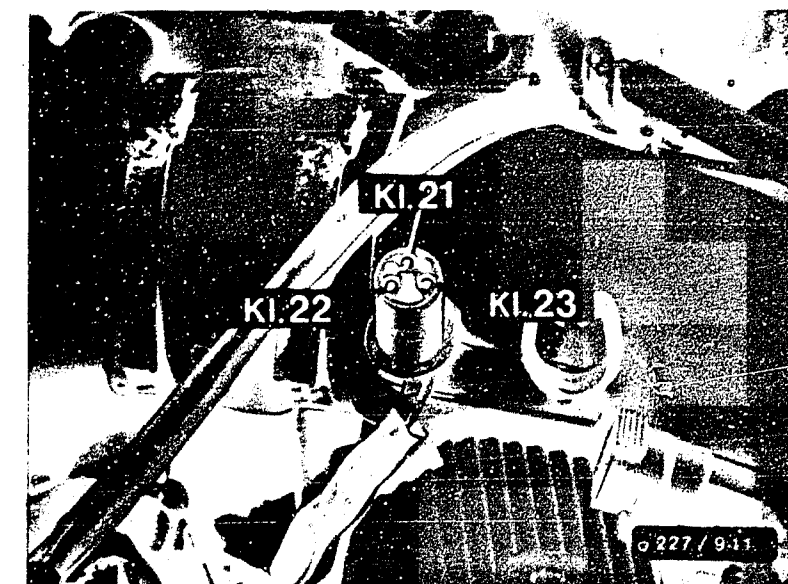
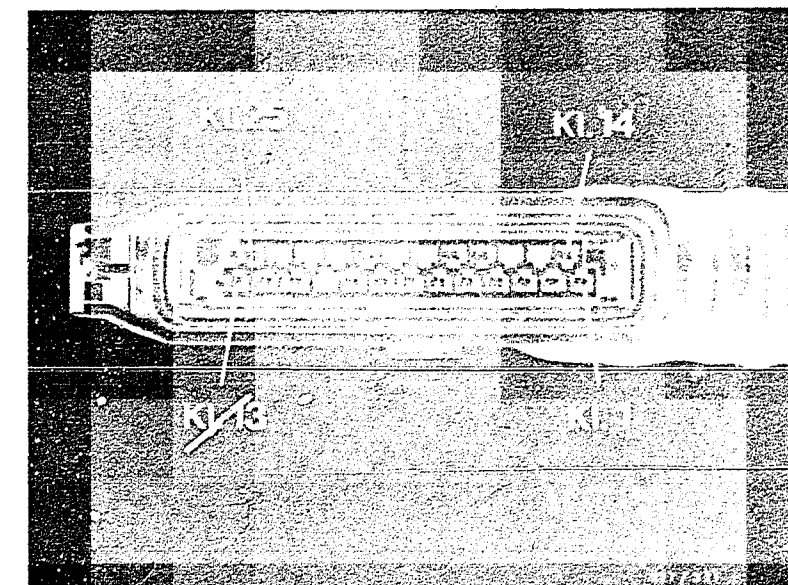
Eliminate conn. with pos. supply.

If positive connection not  
present, replace EI-K control  
unit.

EI-K control-unit plug

Angle-of-rotation-sensor plug  
connection

Return to self-diagnosis B09



TROUBLE-SHOOTING PROGRAM ( 1 )

V

Test high-voltage side.

N>

Repair high-voltage  
side.

Test operation of spark plugs,  
spark-plug connectors, inter-  
ference-suppression resistors,  
H.T. ignition leads, distributor  
cap, distributor rotor etc.  
(e.g. open circuit, shunt).

Assessment e.g. via ignition  
oscillogram, resistance measure-  
ment and visual check.

High-voltage side O.K.?

Y

Return to trouble-shooting chart  
B04

C07

==>

C08

<==>

# TROUBLE-SHOOTING PROGRAM ( 2 )

Test the ignition coil

Visual examination:

Remove protective cap from ignition coil and check that plug is in position and that no sealing compound has escaped. See illustration.

Electrical test:

Ignition coil primary term.15 and term.1

Set value: see brief instructions

(Take resistance of test lead and/or test prods into account.)

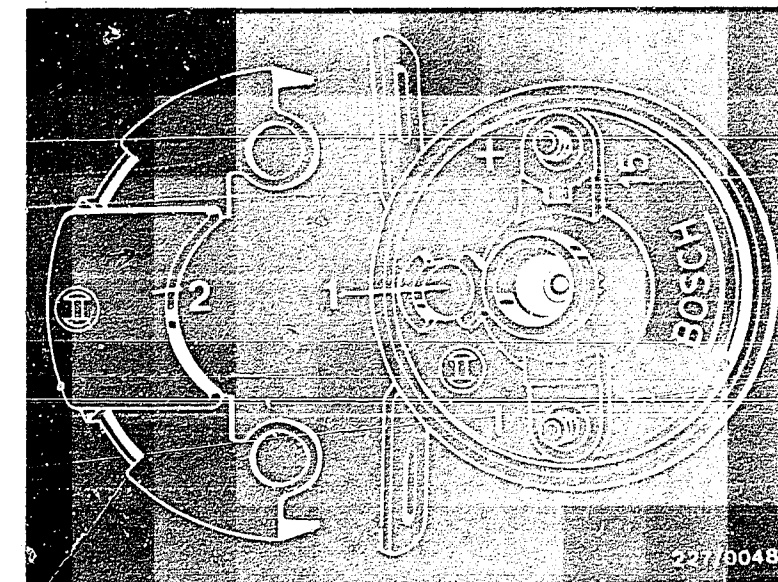
Ignition coil secondary term.1 and term.4

Set value: see brief instructions

Visual examination or is set value obtained?

N>

1. If plug is not in position and/or sealing compound has escaped, replace trigger box and EI-K control unit and ignition coil.
2. If set values are incorrect, replace ignition coil.



1 = Plug  
2 = Protective cap

Return to trouble-shooting chart B04

# TROUBLE-SHOOTING PROGRAM ( 3 )

V

Test voltage supply of trigger box.

Disconnect trigger-box plug and connect voltmeter to term.4 (+) and term.2 (-).  
See illustration.

Switch on ignition.

Set value: battery voltage

Is set value obtained?—

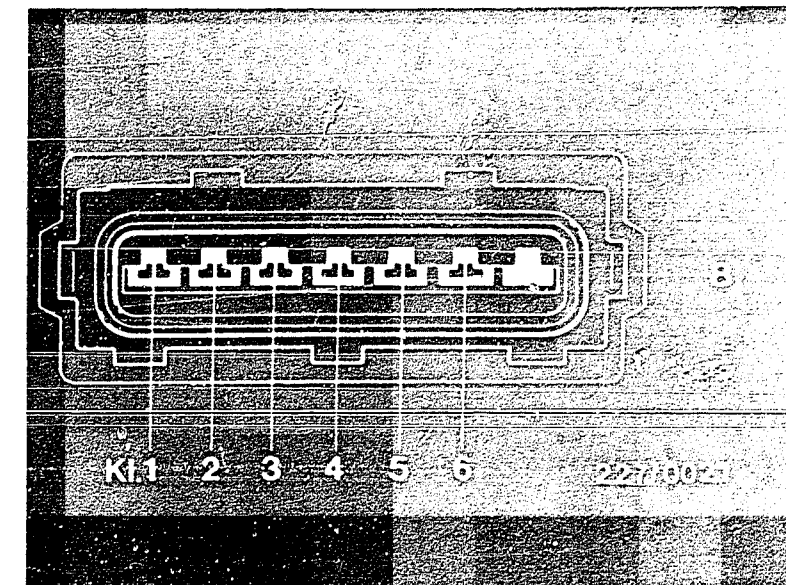
N>

Check leads and connections of ignition and starting switch to trigger-box plug term.4, including ground cable term.2, for open circuit.

Eliminate open circuit.

V

Return to trouble-shooting chart B04



8 = Trigger-box plug

# TROUBLE-SHOOTING PROGRAM ( 4 )

Test voltage supply, primary circuit.

Connect voltmeter to disconnected trigger-box plug term. 1 (+) and term.2 (-) (see illustration).

Switch on ignition.

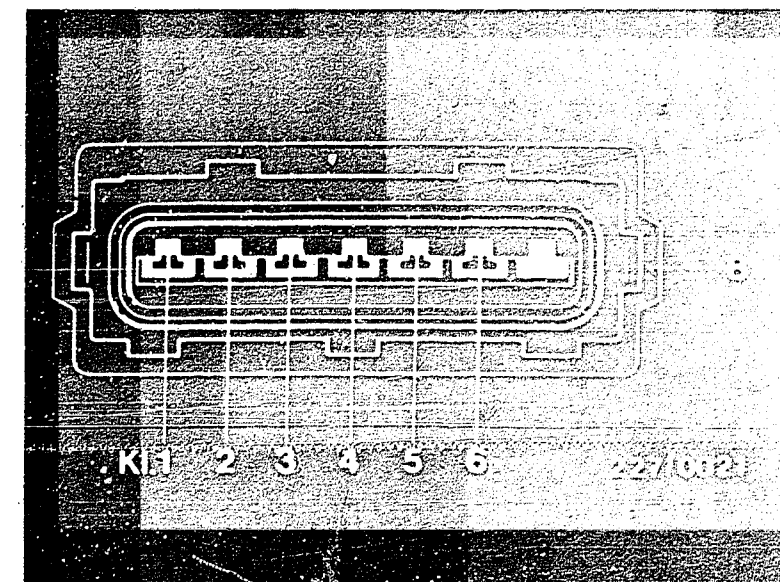
Set value: battery voltage

Is set value obtained?

N>

Check instrument lead from ignition and starting switch to ignition coil term.15, primary winding of ignition coil and lead from ignition coil term.1 to trigger-box plug term.1, including ground cable term.2, for open circuit.

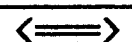
Eliminate open circuit.



8 = Trigger-box plug

Return to trouble-shooting chart B04

C13



C14



# TROUBLE-SHOOTING PROGRAM ( 5 )

Test voltage supply of EI-K control unit.

Switch off ignition.

Pull off EI-K control-unit plug and connect voltmeter to term.6 (+) and term.20 (-). See illustration.

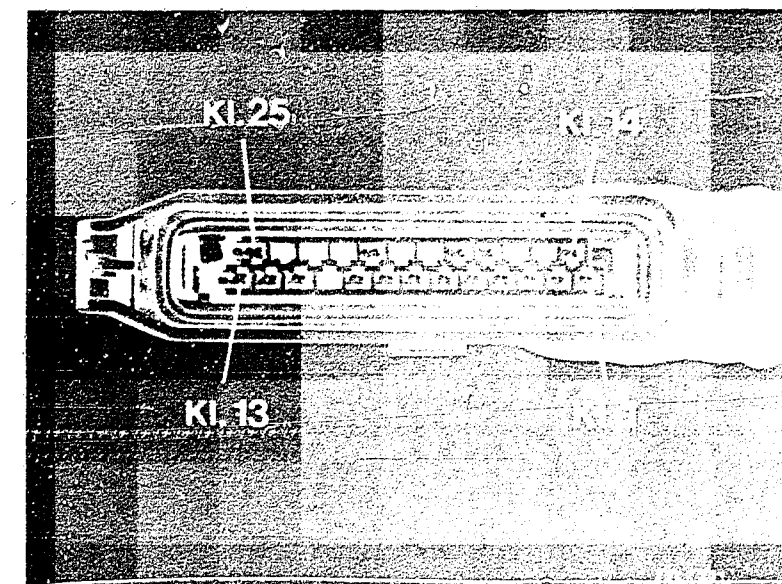
Switch on ignition.

Set value: battery voltage

Is set value obtained?

N>

1. Check lead from ignition and starting switch to EI-K control-unit plug term.6 for open circuit. Eliminate open circuit.
2. Check lead from EI-K control-unit plug term.20 via Jetronic control-unit plug term.5 to valve-cover ground connection for open circuit. Eliminate open circuit.



EI-K control-unit plug

Return to trouble-shooting chart B05



# TROUBLE-SHOOTING PROGRAM ( 6 )

Test ignition-distributor plug  
and ignition-distributor socket.

N>

Eliminate oxidation.

Press off wire clip from  
ignition-distributor plug.  
See arrow, upper illustration.

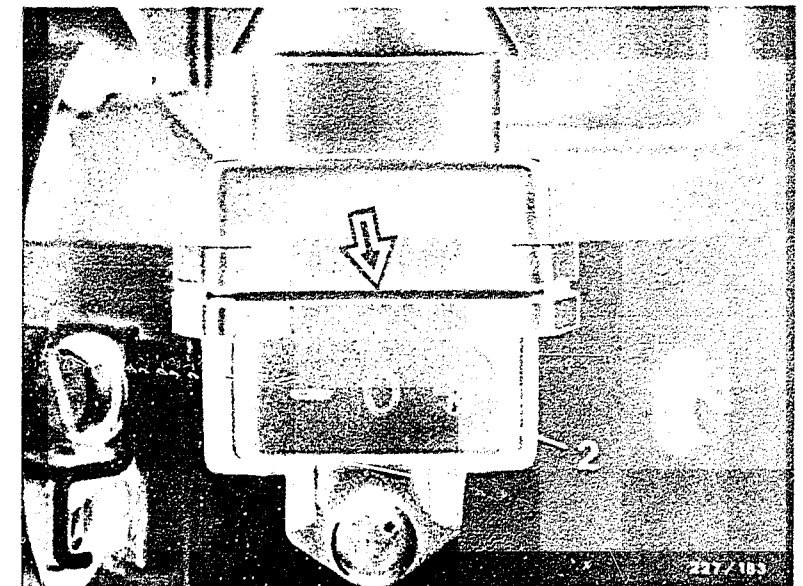
Pull off ignition-distributor  
plug.

Visual examination:

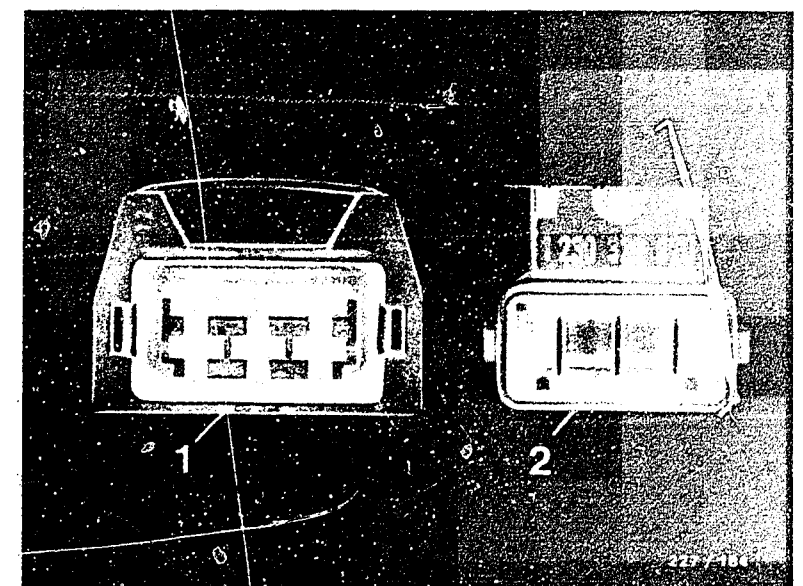
Check contacts of ignition-  
distributor plug and ignition-  
distributor socket for oxidation.

No oxidation?

Return to trouble-shooting chart  
B04



1 = Ignition-distributor plug  
2 = Ignition-distrib. socket



# TROUBLE-SHOOTING PROGRAM ( 7 )

Test voltage supply of magnetic pulse generator.

Ignition-distributor plug and EI-K con.-unit plug are connected.

Push back rubber sleeve from ignition-distributor plug.

Connect voltmeter to ignition-distributor plug term.4 (+) and term.10 (-).

Switch on ignition.

Set value equal to/greater than 10 V.

Is set value obtained?

N>

1. If greater than 0 V was indicated, switch off ignition.

Pull off ignition-distributor plug and connect voltmeter to term.4 (+) and term.10 (-).

Switch on ignition.

If set value equal to/greater than 10 V not obtained, replace EI-K control unit.

If set value equal to/greater than 10 V obtained, replace magnetic pulse generator.

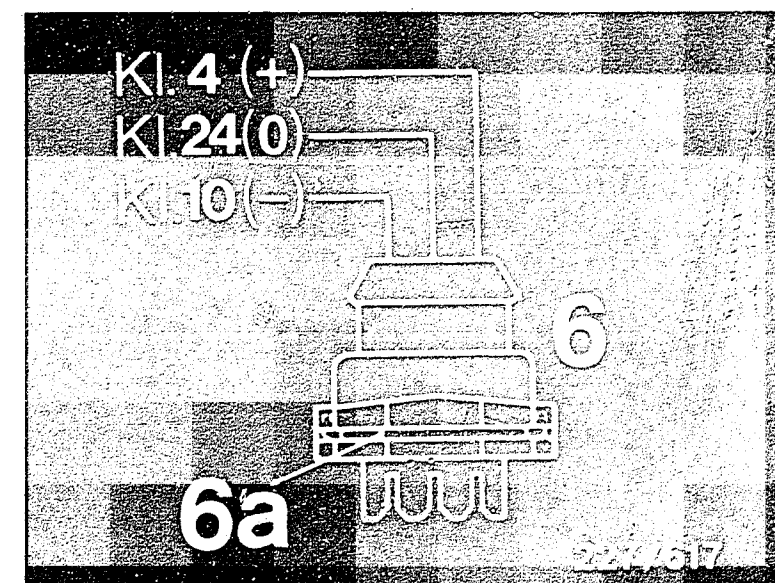
2.If 0 V was indicated, switch off ignition.

Pull off ignition-distributor plug and EI-K control-unit plug. Connect ohmmeter in turn to:

Ignition-dis. plug	EI-K control-unit plug
Term.4	and term.4
Term.10	and term.10

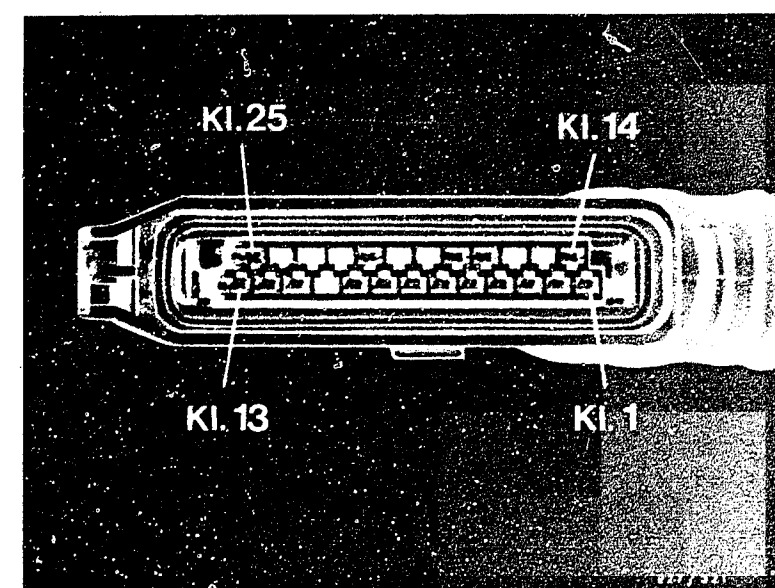
Set value in each case approx. 0  $\Omega$  (continuity). Eliminate open circuit.

If no open circuit present, replace EI-K control unit.



6 = Ignition-distributor plug  
6a = Wire-loop clip

EI-K control-unit plug



Return to trouble-shooting chart B04

# TROUBLE-SHOOTING PROGRAM ( 8 )

V

Test operation of magnetic pulse generator.

N>

Replace magnetic pulse generator and/or ignition distributor.

Ignition-distributor plug and EI-K control-unit plug are connected.

Push back rubber sleeve of ignition-distributor plug.

Connect oscilloscope in accordance with operating instructions and with prog.-selector switch position "Special" selected.

For example, MOT 201:

Red terminal with test prod to ignition-distributor plug term.24 (measuring signal).

Black plug to vehicle ground.

Start engine.

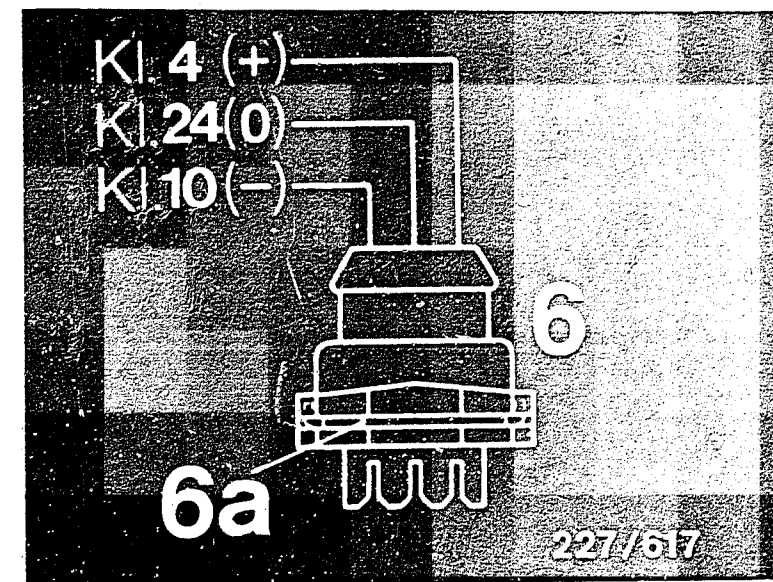
Oscilloscope must indicate rectangular pulse.  
See illustration.

Rectangular pulse present?

Y

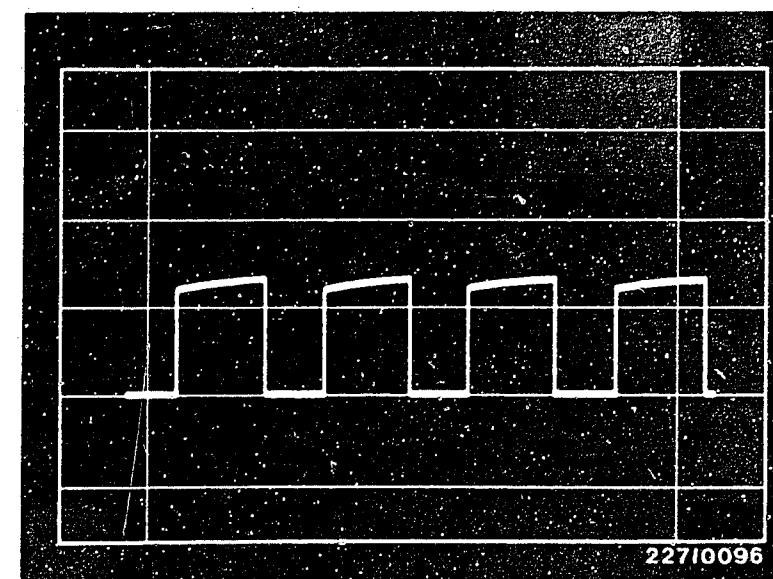
V

Return to trouble-shooting chart B04



6 = Ignition-distributor plug  
6a = Wire-loop clip

Rectangular pulse



# TROUBLE-SHOOTING PROGRAM ( 9 )

V

Test operation of EI-K control unit

N>

Trigger box, ignition distributor and EI-K control-unit plug are connected.

Push back rubber sleeve of trigger-box plug.

Connect oscilloscope in accordance with operating instructions with program-selector switch position "Special" selected.

For example, MOT 201:

Red terminal with test prod in turn to trigger-box plug term.5 and term.6 (measuring signal).

See upper illustration.

Black terminal to vehicle ground.

Start engine.

Oscilloscope must indicate a

rectangular pulse at both terminals.

See lower illustration.

Rectangular pulse present?

Y

V

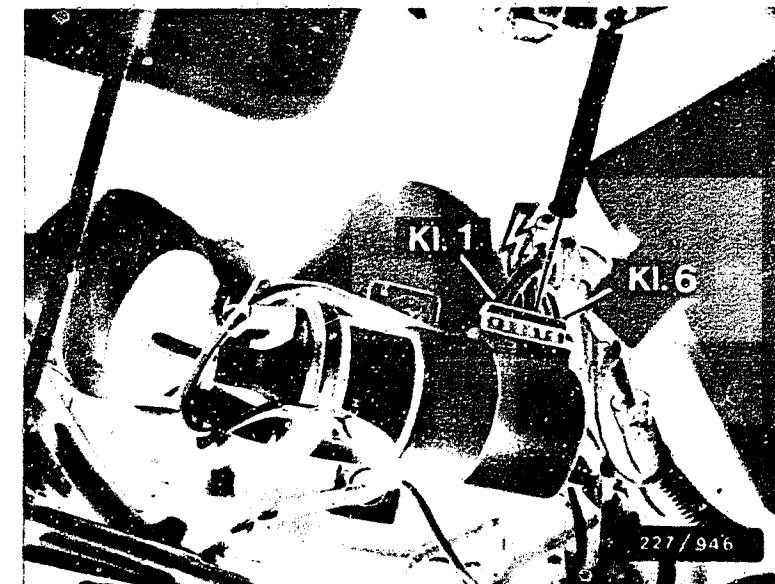
Return to trouble-shooting chart B04

Switch off ignition.

Pull off trigger-box, ignition-distributor and EI-K control-unit plugs.

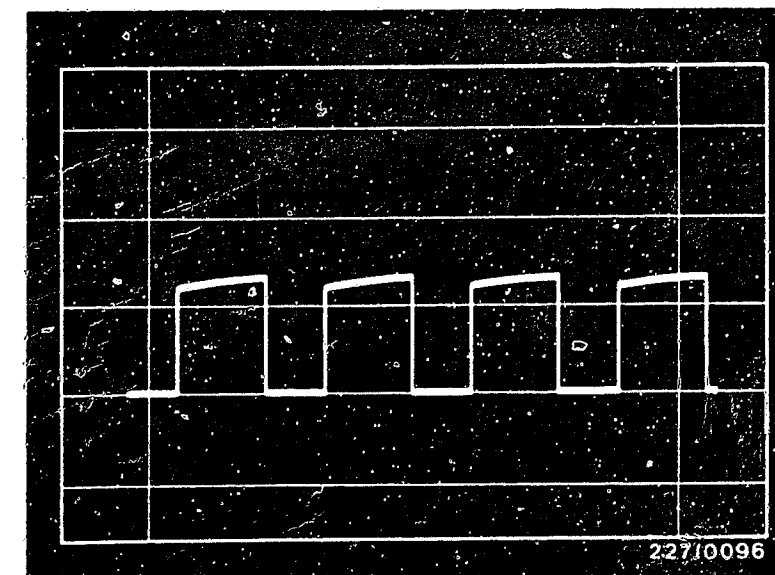
V

Continued on next picture page



High-voltage symbol:  
D a n g e r approx. 400 V

Rectangular pulse



Connect ohmmeter in turn to:

Ignition-distributor plug (EI-K con.-unit  
(upper ill.) plug (center ill.))

Term.24 and Term.24

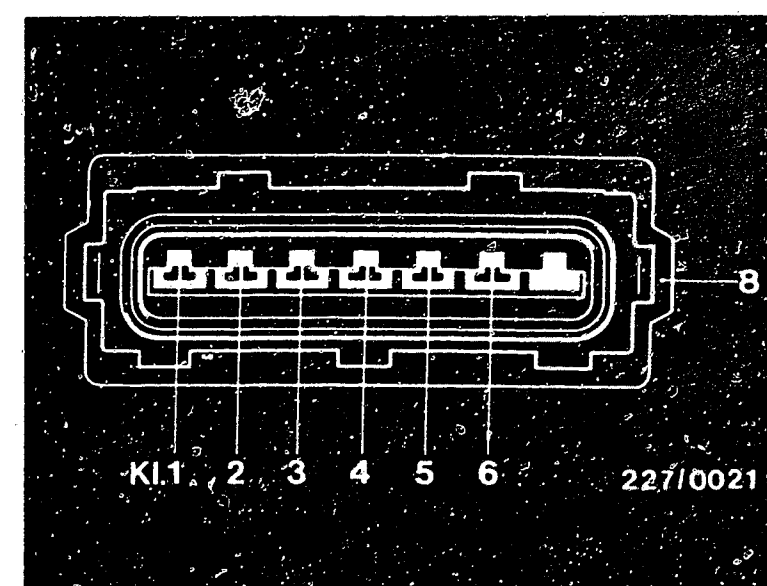
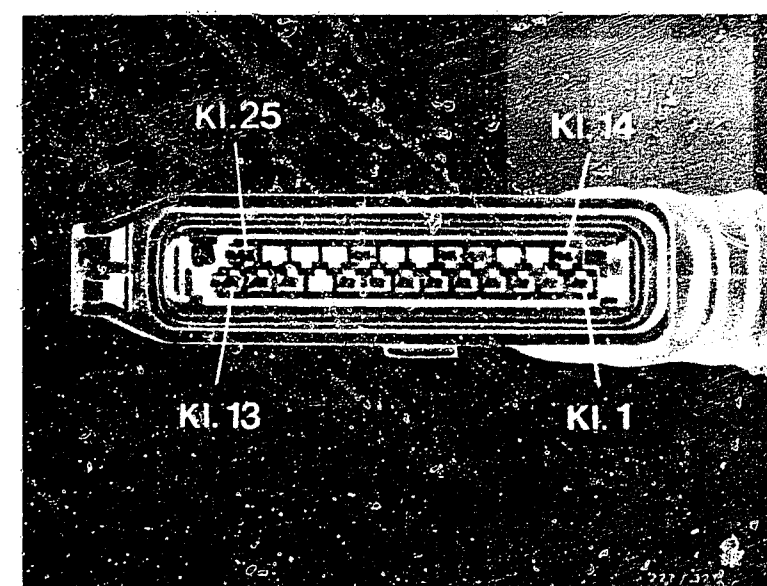
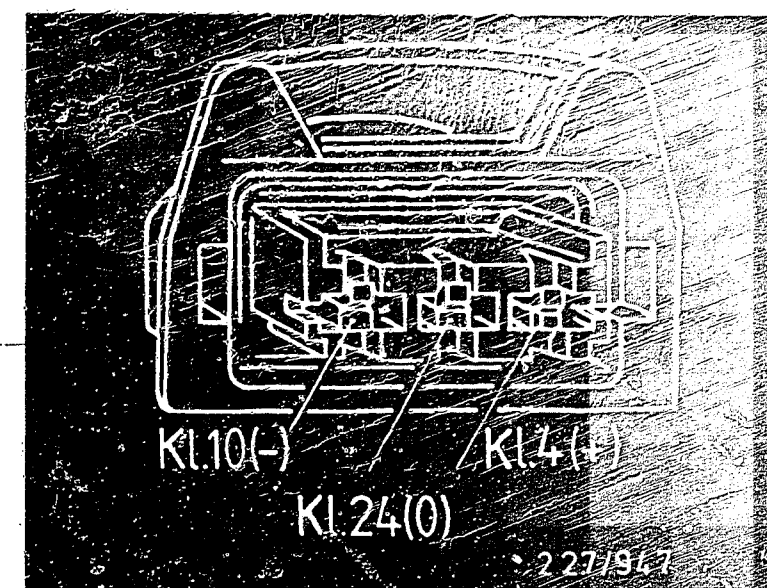
EI-K control-unit plug Trigger-box  
plug  
(lower ill.)

Term.16 and term.5  
Term.16 and term.6

Set value in each case approx.  
0  $\Omega$  (continuity).

Eliminate open circuit.

If no open circuit present,  
replace EI-K control unit.



Return to trouble-shooting chart  
B04

# TROUBLE-SHOOTING PROGRAM (10)

Test assembly adjustment of  
ignition distributor.

Remove protective cover,  
distributor cap and dust-protec-  
tion cover from ignition distri-  
butor. Set cyl. 1 to TDC (P).  
See upper ill. for marking.

The distributor rotor must be  
positioned so that the center  
of the distributor-rotor elec-  
trode points to the housing  
marking of cyl. 1.  
See arrow, lower illustration.

Assembly adjustment of ignition  
distributor O.K.?

Adjust ignition distributor.

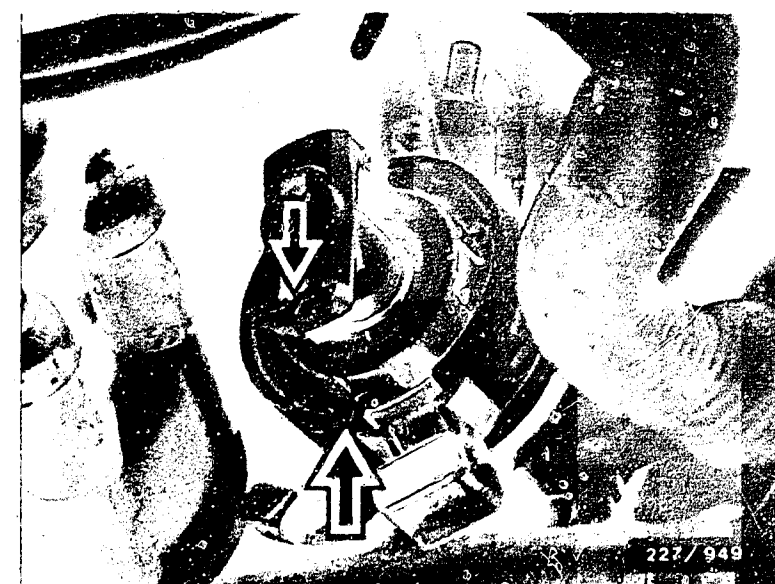


Ignition-point marking

P = TDC

F = 9° before TDC

Return to trouble-shooting chart  
B04





# TROUBLE-SHOOTING PROGRAM (11)

V

Test engine-speed signal.

Switch off ignition.

Pull off Jetronic control-unit plug.

See upper illustration.

Connect oscilloscope in accordance with operating instructions with program-switch selector position "Special" selected.

For example, MOT 201:

Red terminal to Jetronic control-unit plug term.1  
(Measuring signal).

Black terminal to vehicle ground.

Start engine.

Oscilloscope must indicate a rectangular pulse.  
See center illustration.

Rectangular pulse present?

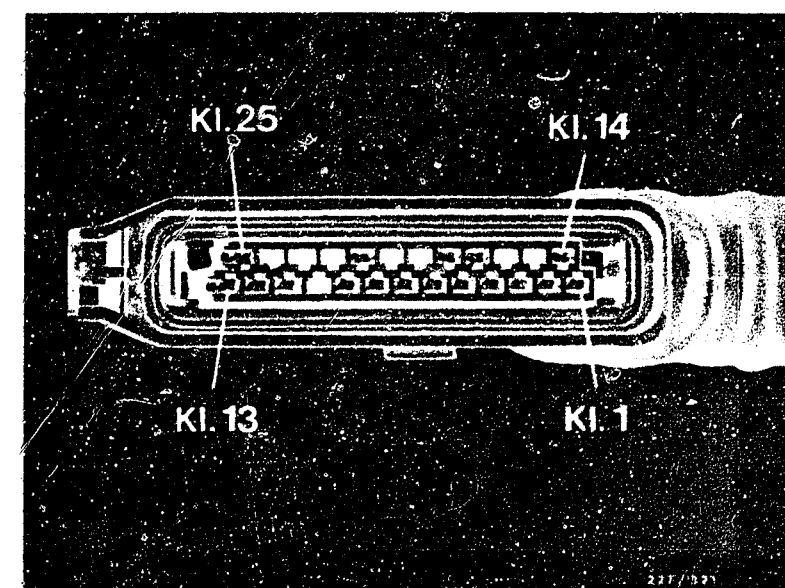
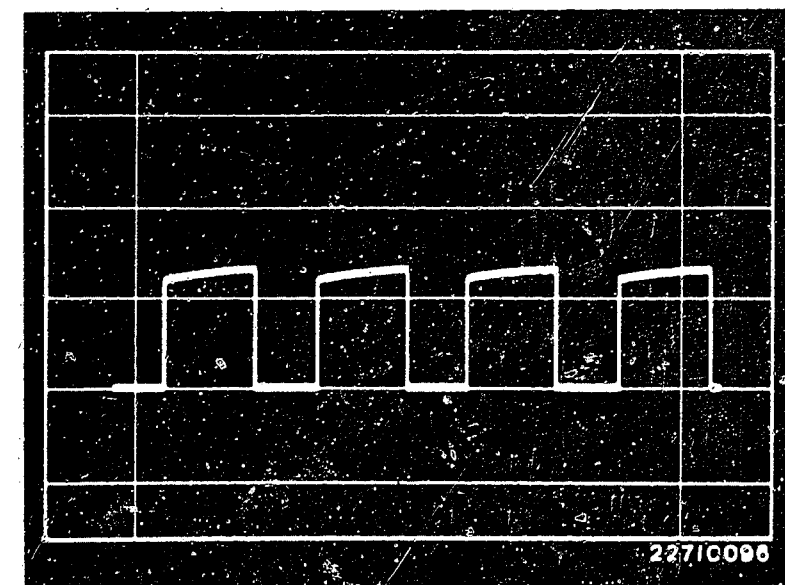
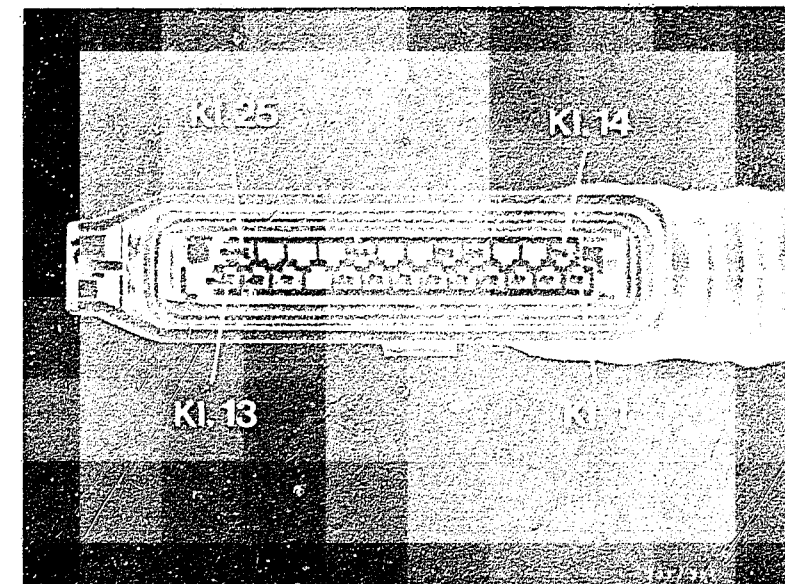
N>

Switch off ignition.

Pull off EI-K control-unit plug (lower illustration) and test lead from EI-K control-unit plug term.17 to Jetronic control-unit plug term.1 for open circuit.

Eliminate open circuit.

If no open circuit present, replace EI-K control unit.



Return to trouble-shooting chart B04

# TROUBLE-SHOOTING PROGRAM (12)

Test contact resistances (primary side).

Disconnect negative and positive cables from battery.  
Pull off trigger-box plug.  
See upper illustration.

Switch on ignition.

Test cables from positive battery terminal to trigger-box plug term.4 and cables from negative battery terminal to trigger-box plug term.2 for contact resistance.

(Take resistance of test lead and test prods into account).

Set value: see brief instructions

Is set value obtained?

N>

Eliminate contact resistance.

Test cables from positive battery terminal to ignition coil term.15 as well as lead from ignition coil term.1 to trigger-box plug term.1 for contact resistance.  
(Take resistance of test lead and test prods into account.)

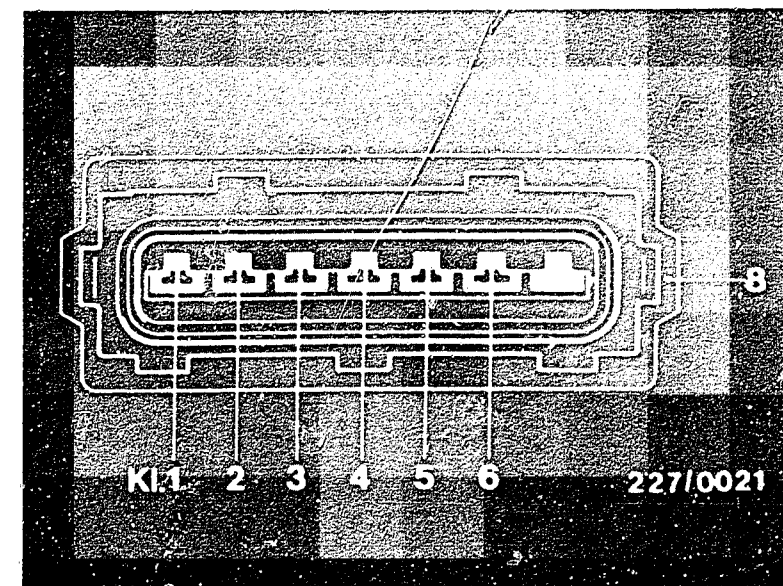
Set value: see brief instructions

Is set value obtained?

N>

Eliminate contact resistance.

Return to trouble-shooting chart B04



8 = Trigger-box plug

# TROUBLE-SHOOTING PROGRAM (13)

## Test fault lamp

1. Switch on ignition (do not start engine). Switch on self-diagnosis switch. Fault lamp must light.

2. Run engine at idle. Fault lamp must go out or may flash.

Does fault lamp light up and has it gone out or flashed at idle?

N>

1. Fault lamp does not light.

Switch off ignition.

Pull off EI-K control-unit plug and apply term.3 to vehicle ground using auxiliary lead. See upper illustration.

Switch on ignition.

If fault lamp lights, replace EI-K control unit.

If fault lamp does not light, remove instrument panel.

Test operation of fault lamp (12 V). See lower illustration.

Test lead from ignition and starting switch term.15 to fuse no. 15 via self-diagnosis switch term.15 and term.3 to fault lamp (+), and lead from EI-K control-unit plug term.3 to fault lamp (-) for open circuit.

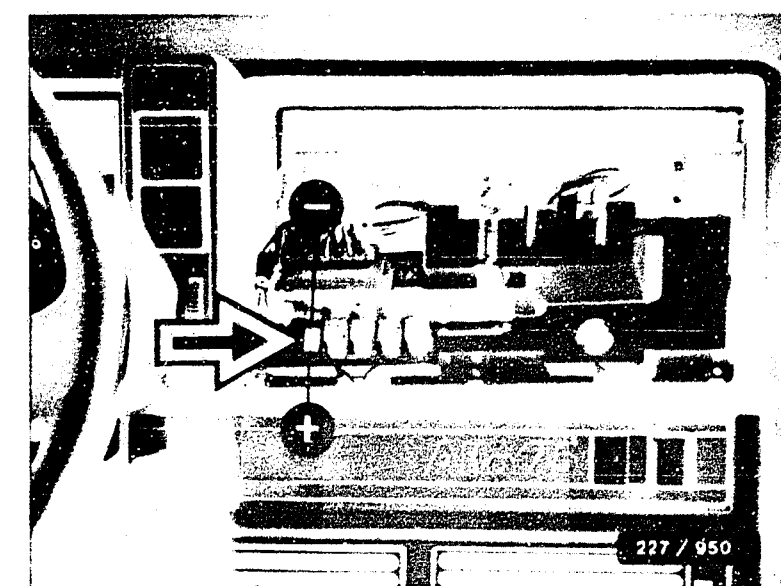
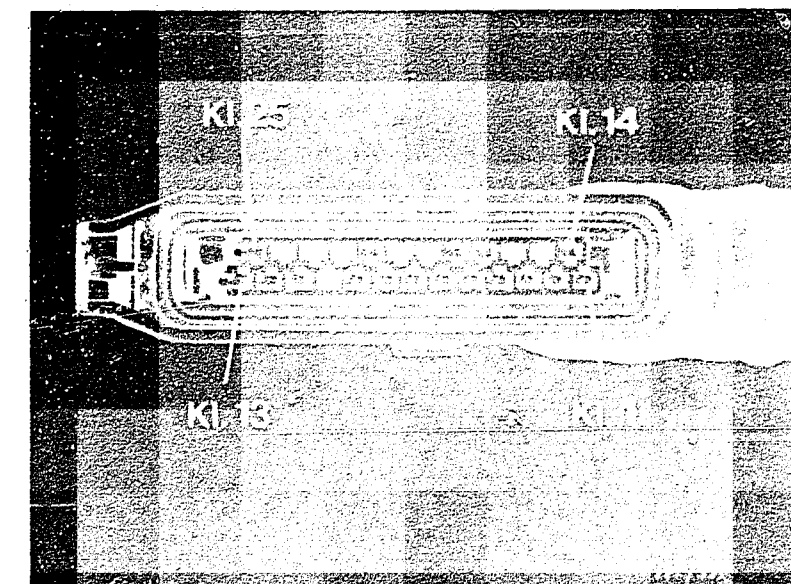
Eliminate open circuit.

EI-K control-unit plug

Arrow = Fault lamp

Return to trouble-shooting chart B04

Continued on next picture page



V  
2. Fault lamp lights constantly.

Switch off ignition.

Pull off EI-K control-unit plug.

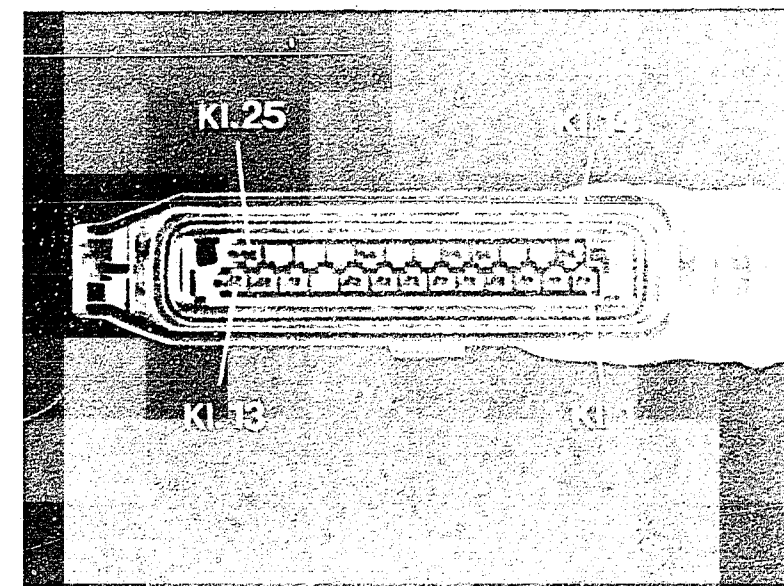
Switch on ignition.

If fault lamp is no longer lit, replace EI-K control unit.

If fault lamp is still lit, short circuit to ground of self-diagnosis switch, fault lamp or connecting lead term.3.

Eliminate short circuit to ground.

EI-K control-unit plug



V  
Return to trouble-shooting chart  
B04

# TROUBLE-SHOOTING PROGRAM (14)

Test idle throttle-valve switch.

Run engine at approx. 3000 min -1 .

Light up ignition-timing mark using timing strobe.  
See upper illustration.

With the aid of the strobe, manually adjust (retard) the ignition timing until approx. TDC is indicated.  
See upper illustration.

Close idle switch manually (as far as it will go).  
See center illustration, arrow.

The ignition-point marking must now show an adjustment (engine speed may be altered).

Has ignition-point marking been adjusted?

Return to trouble-shooting chart B04

N>

1. Switch off ignition.

Pull off both throttle-valve-switch plugs and connect voltmeter (+) to term.87 (2-core lead) and to vehicle ground.  
See center illustration.

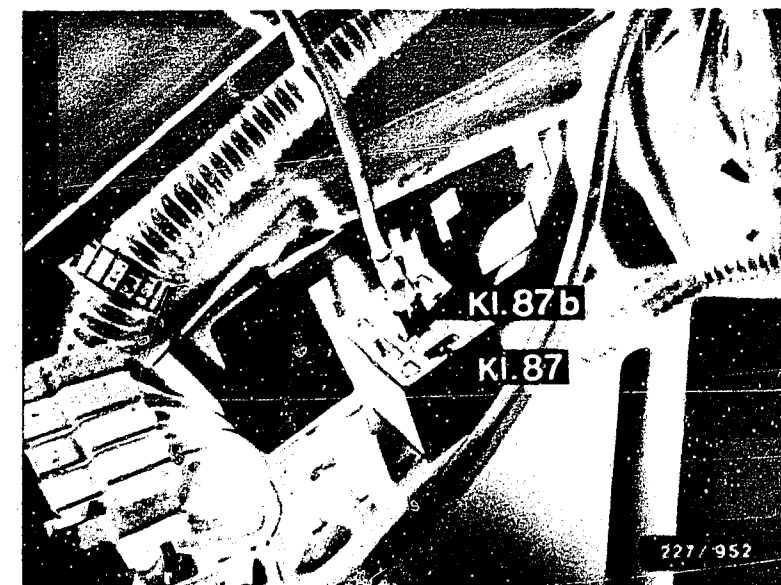
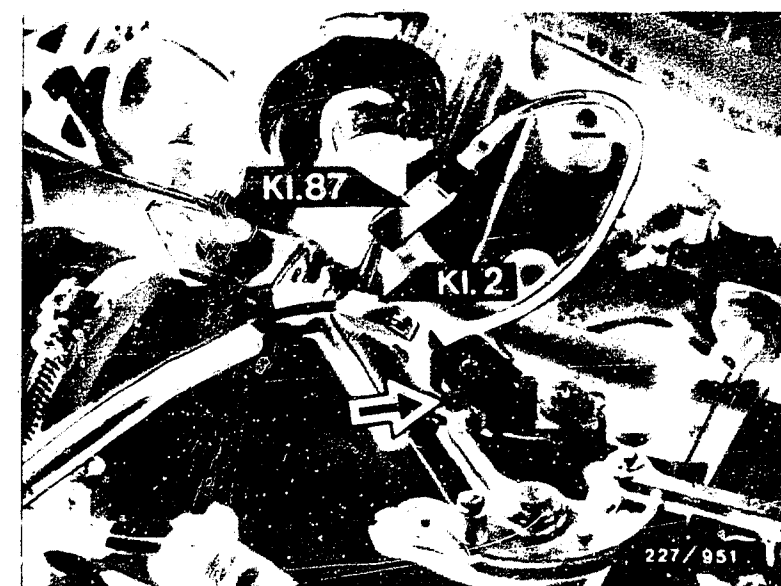
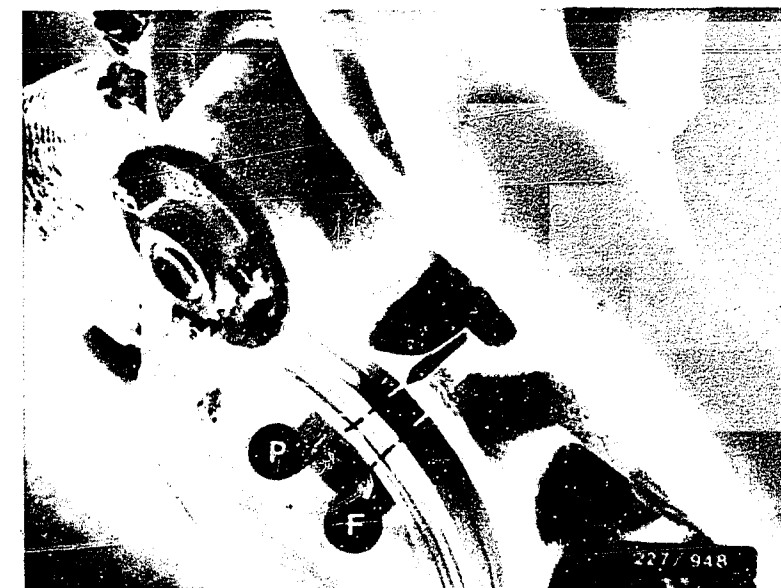
Run engine at idle.

Voltmeter must indicate approx. battery voltage.

If battery voltage not indicated, pull off electric-fuel-pump relay, and test lead from throttle-valve-switch plug term.87 to electric-fuel-pump-relay plug term.87 (lower illustration) for open circuit.

Eliminate open circuit.

Continued on next picture page

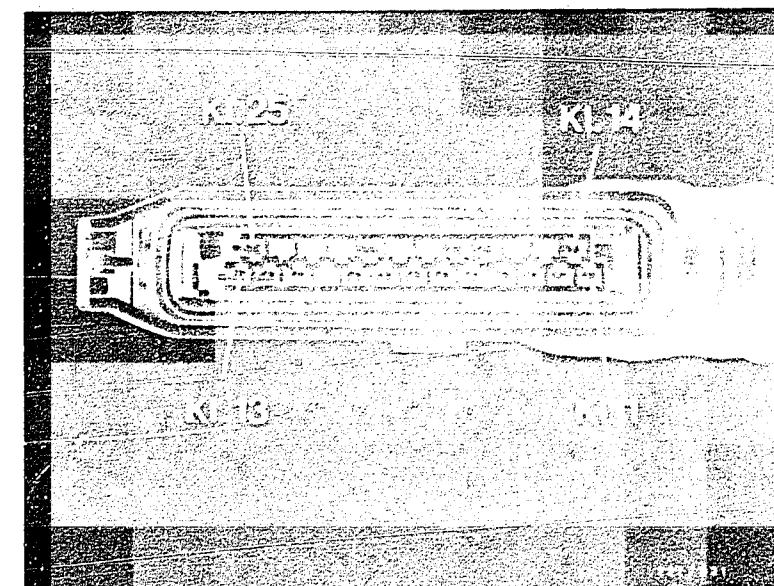


2. Switch off ignition.

Pull off EI-K control-unit plug.  
See upper illustration.

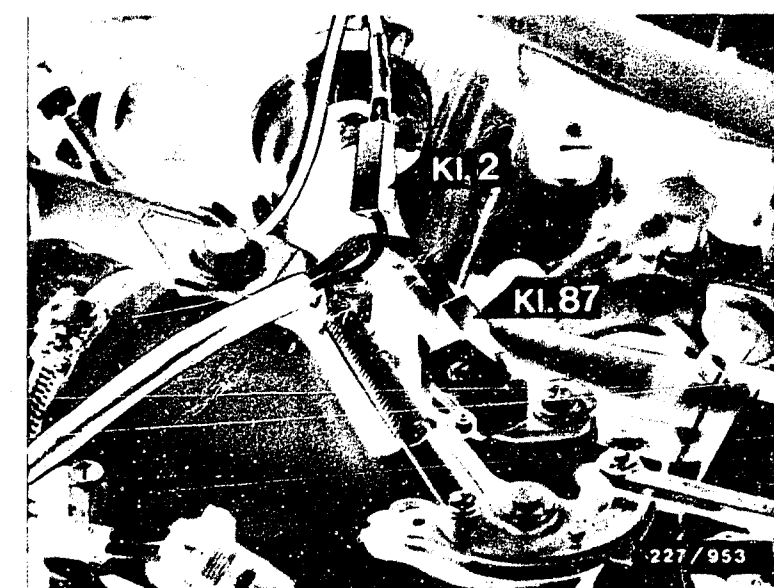
Test leads from EI-K control-unit plug term.7 via Jetronic control-unit plug term.2 to throttle-valve-switch plug term.2 (lower illustration) for open circuit.

Eliminate open circuit.



EI-K control-unit plug

Throttle-valve-switch plug



Continued on next picture page



3. Connect ohmmeter to throttle-valve switch.  
See upper illustration, arrow.

Throttle valve is in idle position.

Ohmmeter must indicate approx.  
 $0 \Omega$  (continuity).

If approx.  $0 \Omega$  not indicated,  
adjust throttle-valve switch  
after loosening the mounting.

If resistance value of approx.  
 $0 \Omega$  is still not obtained,  
replace throttle-valve switch.

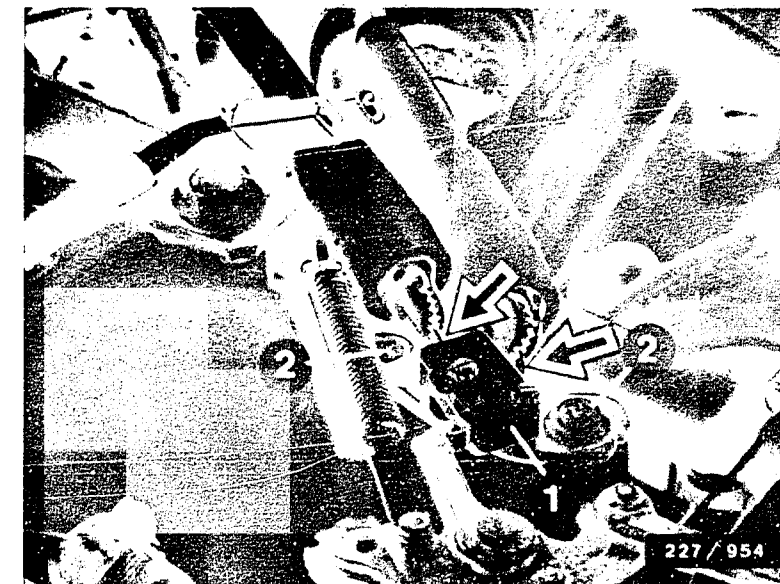
C h e c k :

Open throttle valve.

Ohmmeter must indicate infinite  
 $\Omega$  (open circuit).

If approx.  $0 \Omega$  indicated,  
replace throttle-valve switch.

If points 1, 2 and 3 O.K.,  
replace EI-K control unit.



1 = Idle throttle valve  
2 = Throttle-valve-switch  
mounting

Return to trouble-shooting chart  
B04

# TROUBLE-SHOOTING PROGRAM (15)

V

Test basic ignition adjustment.

Pull off both throttle-valve  
switch plugs and bridge using  
auxiliary lead (upper ill.).  
See center illustration, arrow.

Run engine at 850...1100 min <sup>-1</sup> .

Read off spark advance (marking  
"F").  
See lower illustration.

Set value: see brief instructions

Is set value obtained?

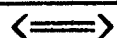
N>

Loosen ignition-distributor  
mounting and turn ignition  
distributor until set value  
is obtained.

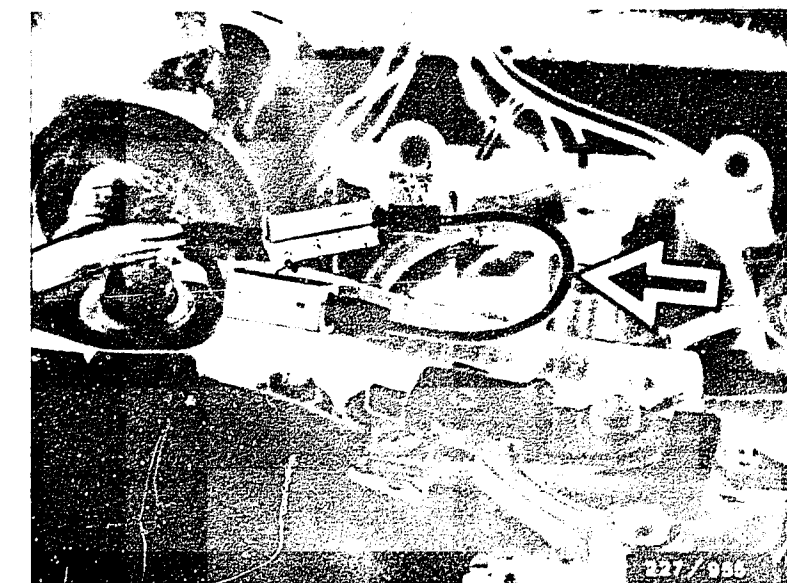
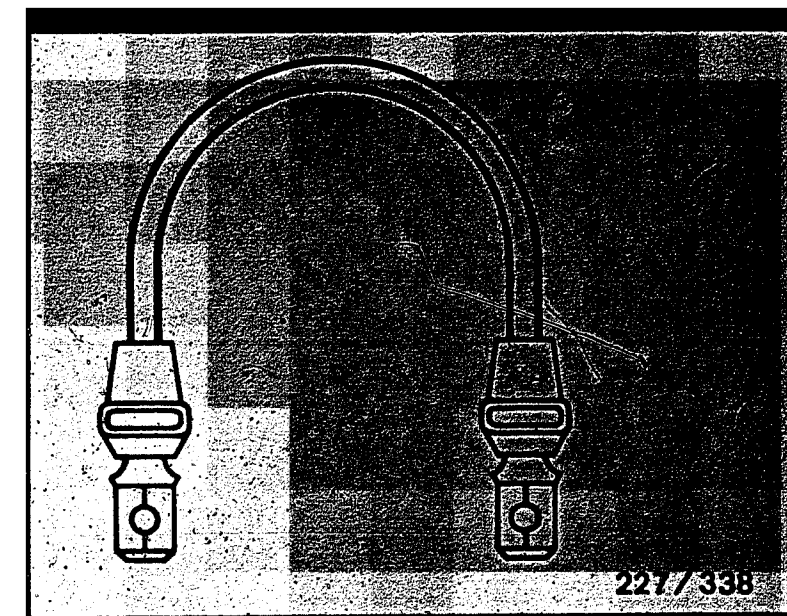
V

Return to trouble-shooting chart  
B04

D15



D16



# TROUBLE-SHOOTING PROGRAM (16)

V

## Test fuel enrichment

### 1. Switch off ignition

Pull off EI-K control-unit plug and push back handle cover after unscrewing the fastening screws and removing the rubber seal.

Connect EI-K control-unit plug. See upper illustration.

Connect voltmeter to EI-K control-unit plug term.18 (+) and to vehicle ground. See upper illustration.

Run engine at idle.

Set value: 0 V up to max. 1 V

2. Bridge EI-K control-unit plug term.21 and term.22 using auxiliary lead. See upper illustration.

Run engine at idle.

Set value: battery voltage

Is set value obtained under points 1 and 2?

V

Return to trouble-shooting chart B04

N>

If greater than 1 V was indicated under point 1, switch off ignition.

Remove auxiliary lead from EI-K control-unit plug term.21 and term.22. Pull off EI-K control-unit plug and Jetronic control-unit plug.

Connect voltmeter to EI-K control-unit plug term.18 (+) and to vehicle ground. Switch on ignition.

If voltage of greater than 1 V is still indicated, lead from EI-K control-unit plug term.18 to Jetronic control-unit plug term.3 has connection with positive battery terminal. Eliminate connection. Switch off ignition.

Connect Jetronic control-unit plug.

Switch on ignition.

If voltage of greater than 1 V is now indicated, replace Jetronic control unit. Switch off ignition.

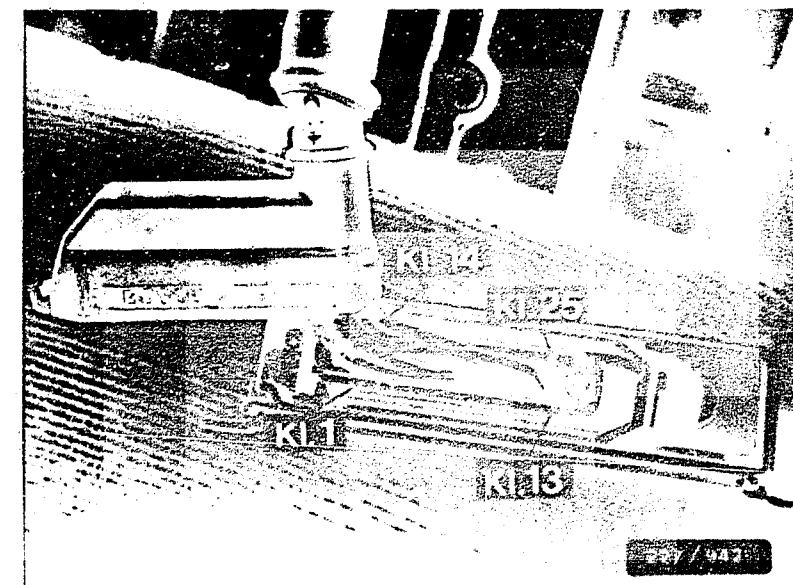
Pull off Jetronic control-unit plug and connect voltmeter to term.3 (+) and to vehicle ground. Connect EI-K control-unit plug.

Switch on ignition.

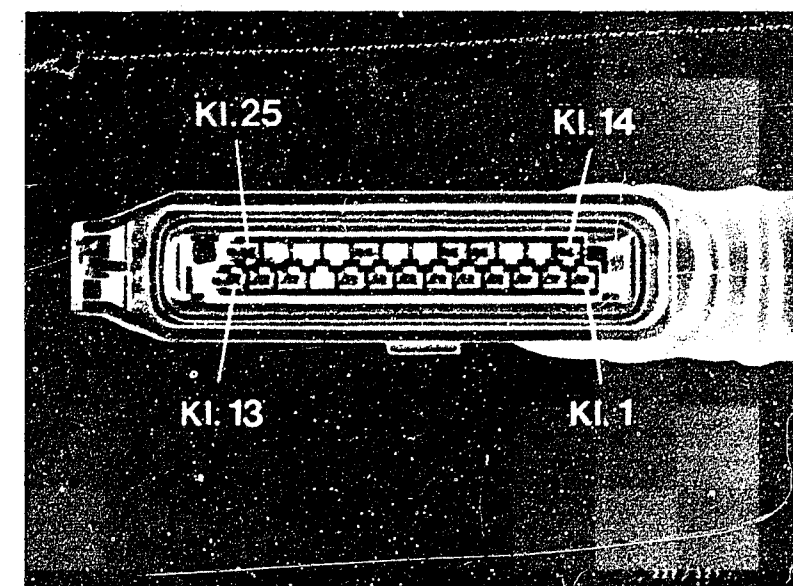
If voltage of greater than 1V is now indicated, replace EI-K control unit.

V

Continued on next picture page



EI-K control-unit plug



Jetronic control-unit plug

↓

If no battery voltage was indicated under point 2, test lead from EI-K control-unit plug term.18 to Jetronic control-unit plug term.3 for short circuit to ground and open circuit.

Eliminate short circuit to ground and/or open circuit.

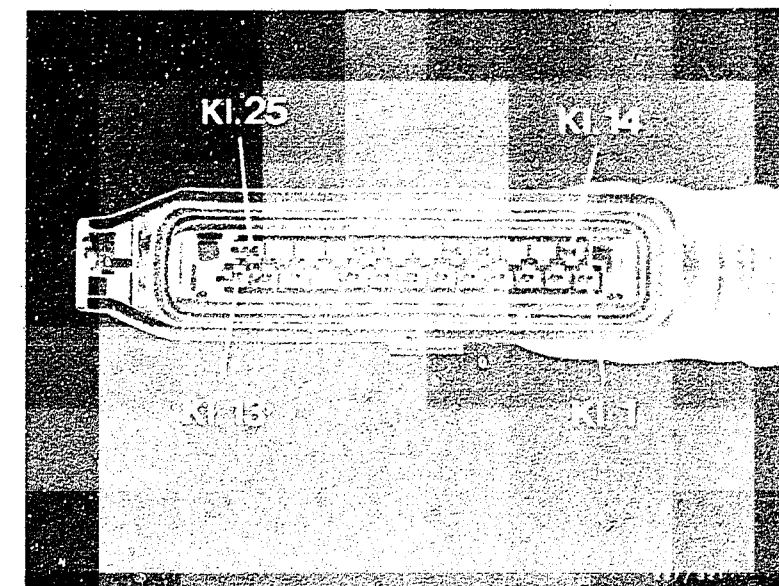
Test lead from EI-K control-unit plug term.19 (upper ill.) to electric-fuel-pump-relay plug term.87b (lower ill.) for open circuit.

Eliminate open circuit.

If no open circuit present, replace EI-K control unit.

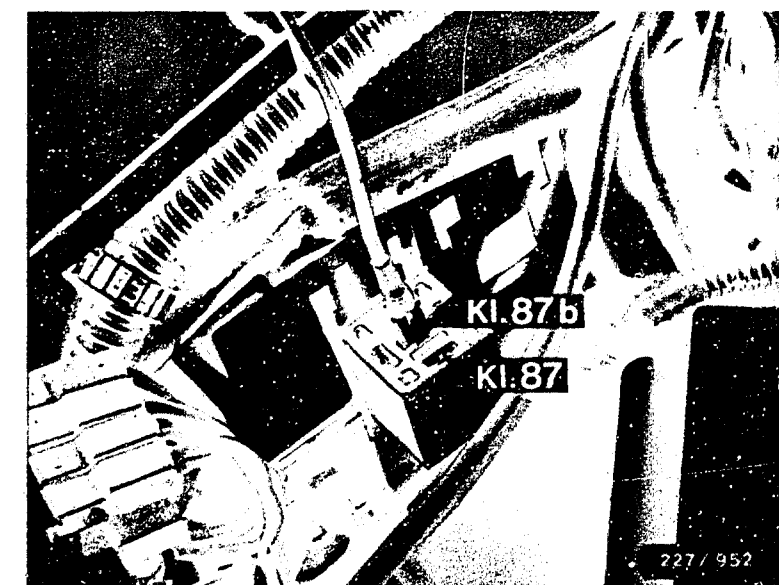
↓

Return to trouble-shooting chart B04



EI-K control-unit plug

Electric-fuel-pump-relay plug



# TROUBLE-SHOOTING PROGRAM (17)

V

Test charge-air-press. timing valve.

Test requirement: fault lamp must not flash.

Switch off ignition.

Pull off EI-K control-unit plug and push back handle cover after unscrewing fastening screws and remove the rubber seal. See upper illustration.

Connect EI-K control-unit plug and connect up term.21 and term.22 using auxiliary lead. Run engine at approx. 2500 min<sup>-1</sup>.

Timing valve must operate (feeleable by hand). See lower illustration, arrow.

Timing valve operating?

N>

Switch off ignition.

Pull off EI-K control-unit plug and connect voltmeter to term.2 (+) and term.14 (-).

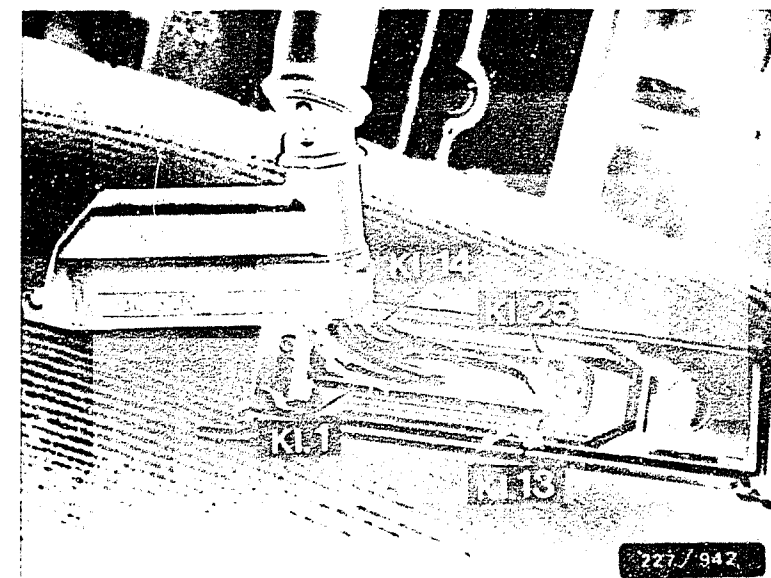
Switch on ignition.

Voltmeter must indicate approx. battery voltage.

If battery voltage not indicated, test instrument lead from ignition and starting switch term.15 to timing valve term.15, timing-valve winding, as well as lead from timing vglve term.2 to EI-K control-unit plug term.2 and ground lead term.14 for open circuit.

Eliminate open circuit.

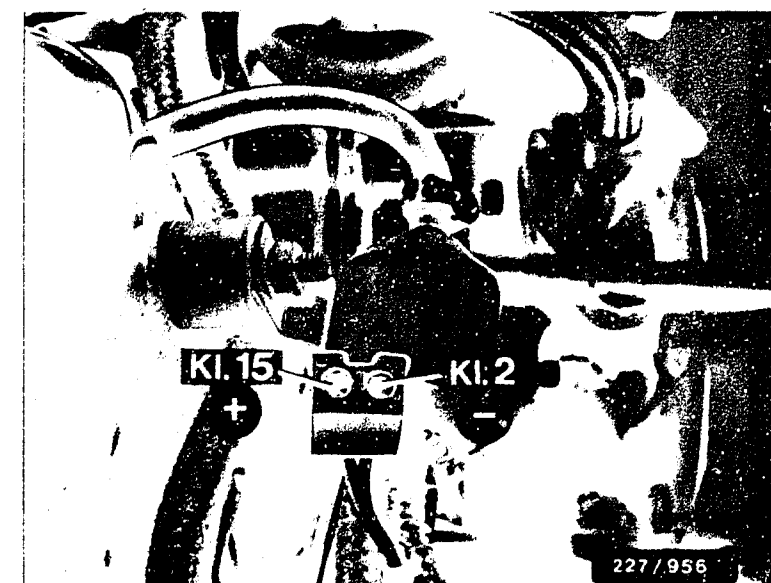
If no open circuit present, replace EI-K control unit.



EI-K control-unit plug

V

Return to trouble-shooting chart B04



# TROUBLE-SHOOTING PROGRAM (18)

V

Test voltage supply of trigger box.

Push back rubber sleeve from trigger-box plug.

Connect voltmeter to trigger-box plug term.4 (+) and term.2 (-). See illustration.

Run engine at idle.

Set value: 12...14 V  
or may be max. 1 V below battery voltage.

Is set value obtained?

N>

Run engine at idle.

1. Connect voltmeter (+) to positive battery terminal and trigger-box plug term.4 (-).

Voltage drop may be max. 0.5 V.

Eliminate voltage drop.

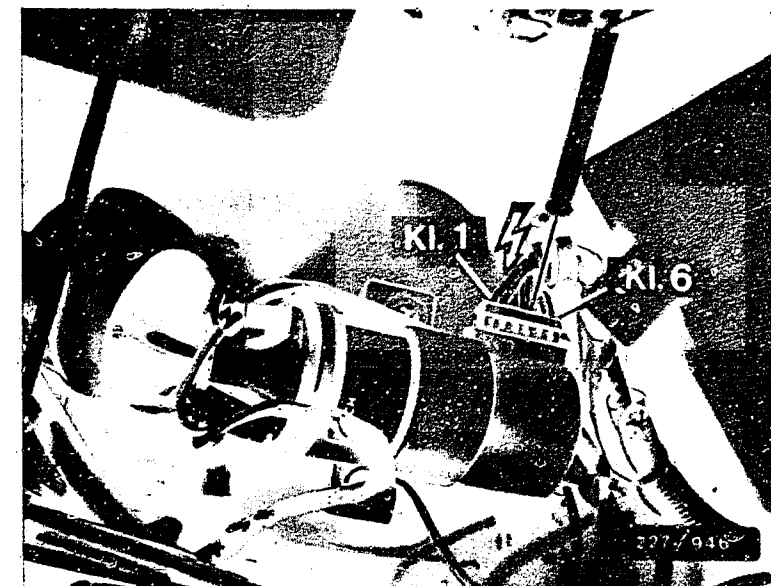
2. Connect voltmeter (-) to negative battery terminal and trigger-box plug term.2 (+).

Voltage drop must be max. 0.5 V.

Eliminate voltage drop.

V

Return to trouble-shooting chart B04



High-voltage symbol:  
D a n g e r approx. 400 V



TROUBLE-SHOOTING PROGRAM (19)

V

Test voltage supply of ignition coil.

Conn. voltmeter to ignition coil t.15 (+) and to neg. batt. term.

Run engine at idle.

Set value: equal to or greater than 10 V

Is set value obtained?

N>

Run engine at idle.

1. Connect voltmeter (+) to positive battery terminal and to ignition coil term. 15 (-).

Voltage drop must be max. 0.5 V.

Eliminate voltage drop.

2. Connect voltmeter (-) to negative battery terminal and to trigger-box plug term.2 (+).

Voltage drop must be max. 0.5 V.

Eliminate voltage drop.

Y

Return to trouble-shooting chart B04

# TROUBLE-SHOOTING PROGRAM (20)

V

Test primary voltage.  
(As long as MOT series available)

N>

Connect oscilloscope (e.g. MOT  
201) together with pulse shaper  
1 684 463 154 to ignition coil  
in accordance with operating  
instructions.

N o t e :  
Without pulse shaper, incorrect  
measured value.

Run engine at idle.

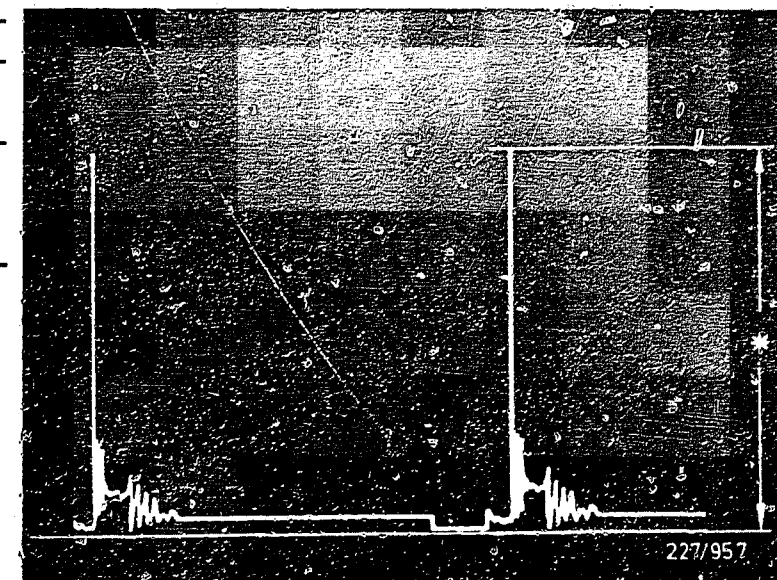
Set value: see illustration  
and brief instructions

Is set value obtained?

V

Return to trouble-shooting chart  
B04

Replace trigger box.



\* = See Brief Instructions

DANGER OF ACCIDENT ON SEMI-  
CONDUCTOR IGNITION SYSTEMS

|22|  
VDT-I-227/102 En  
03.1981

Supersedes Feb. 3, 1976 edition

Please be sure to pass this bulletin together with VDE 0104/7.67 enclosed on to your employees for their attention.

The increased demands made on their ignition systems by modern engines, and the wish for freedom from maintenance, led some time ago to manufacturers starting to equip their vehicles with semi-conductor ignition systems as original equipment.

In most cases, the performance of nearly all makes of such systems is higher than that of conventional systems, and further improvements are to be expected. This means that semi-conductor ignition systems have reached the point where contact with "live" components or terminals (whether on the primary side or the secondary side) can prove fatal.

In this connection, we should like to point out to you that the laws valid in your country regarding work on high-voltage systems must be adhered to when working on, or testing, semi-conductor ignition systems.

As a matter of principle, when working on such ignition systems, the ignition is to be switched off.

Included in such work are the following operations:

- \* Connection of engine testing equipment (timing strobe, dwell-tach tester, ignition oscilloscope etc.)
- \* Replacement of ignition system components (spark plugs, ignition coil, ignition distributor, H.T. ignition cables etc.)

If it is necessary to switch on the ignition in order to test the system or make adjustments on the engine (to the carburetor, for instance), then lethal voltages are present throughout the entire system.

This means that the danger of accident exists not only at the individual components in the system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also at the wiring harness (e.g. connection for the tachometer, diagnostic connector), on terminals, and on test equipment.

In addition, in the case of the capacitor-discharge ignition system (CDI), danger of accident is also present under the following circumstances:

- \* Operation of the trigger box without the ignition transformer.
- \* At the trigger box, (removed), relatively soon after it has been switched off (capacitor discharge).

Below is a typical terminal diagram of a semi-conductor ignition system, the dangerous locations being marked with high-voltage arrows.

We would point out that all semi-conductor ignition systems, even the older versions, are to be regarded as dangerous in the sense as defined by this bulletin.

VDT-I-227/107 En  
01.1981

EFFECTS OF ELECTRICAL AND  
ELECTRONIC SYSTEMS ON HEART  
PACEMAKERS

e.g. Ignition systems, Jetronic, Motronic, ABS

Please ensure that this Bulletin is passed  
on to your employees for their attention.

We have often been asked by some of our  
customers whether or not patients with heart  
pacemakers are endangered in any way by  
ignition systems. This theme was recently  
the subject of an examination carried out by  
the Ignition System Development Department of  
Robert Bosch GmbH in conjunction with Dr.  
Thull, lecturer at the Central Institute for  
Biomedical Technology at the University of  
Erlangen-Nürnberg and Biotronic GmbH & Co.  
of Berlin, a manufacturer of heart pacemakers.  
The magazine "Biomedizinischen Technik"  
(5/80) published the results.

The most important discoveries in this practice  
can be summarized from the examination report  
as follows:

1. Heart pacemakers corresponding to the  
latest state of the art are not affected  
by radiation (electromagnetic fields) from  
ignition systems.
2. With a stationary engine and the ignition  
switched off, the heart pacemaker is not  
affected by any part of the ignition system,  
even when unintentionally touched. Main-  
tenance work in the engine compartment, for  
example, can then be carried out without  
any danger.

- 1 = Battery
- 2 = Ignition lock
- 3 = Trigger box
- 4 = Resistor
- 5 = Ignition distributor
- 6 = Ignition coil
- 7 = To starting motor term. 16
- 8 = To tachometer connection  
or diagnostic plug  
or TD connection

Published by:

Robert Bosch GmbH  
Division KH  
After-Sales Service Department for  
Training and Technology (KH/VSK)

Please direct questions and comments  
concerning the contents to our authorized  
representative in your country.

3. With the engine running or stationary with the ignition switched on, touching current-carrying parts of the ignition system, as well as parts of any other electrical system, presents a certain danger for everybody. The heart pacemaker can here be affected under certain conditions (voltage, current and frequency). Patients with heart pacemakers should therefore at all costs avoid touching current-carrying parts of electrical systems.
4. Furthermore, patients with heart pacemakers are more inclined to psychic shock effects than other people, even when they receive just a harmless electric shock, because many such patients are conscious of the increased danger to the cardiac activity.

We therefore consider it inadvisable for patients with heart pacemakers to be employed in workshops or on vehicles where ignition systems are being tested or repaired. If any members of your staff have heart pacemakers, please introduce the necessary measures.

We would like to add that heart pacemakers are not expected to be affected in any way by interference from other electronic products and systems which we manufacture, such as the Antiskid System (ABS), Jetronic, Motronic, because the much greater radiation intensity of the ignition systems examined in normal use has not caused any interference to heart pacemakers corresponding to the latest state of the art.

If you should receive questions on this matter from customers, please inform them accordingly.

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Robert Bosch GmbH  
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Please direct questions and comments concerning the contents to our authorized representative in your country.

# TECHNICAL BULLETIN

KNOCK SENSOR 0 261 231 ..

VDT-I-227/110 En  
03.1983

Procedures for after-sales service

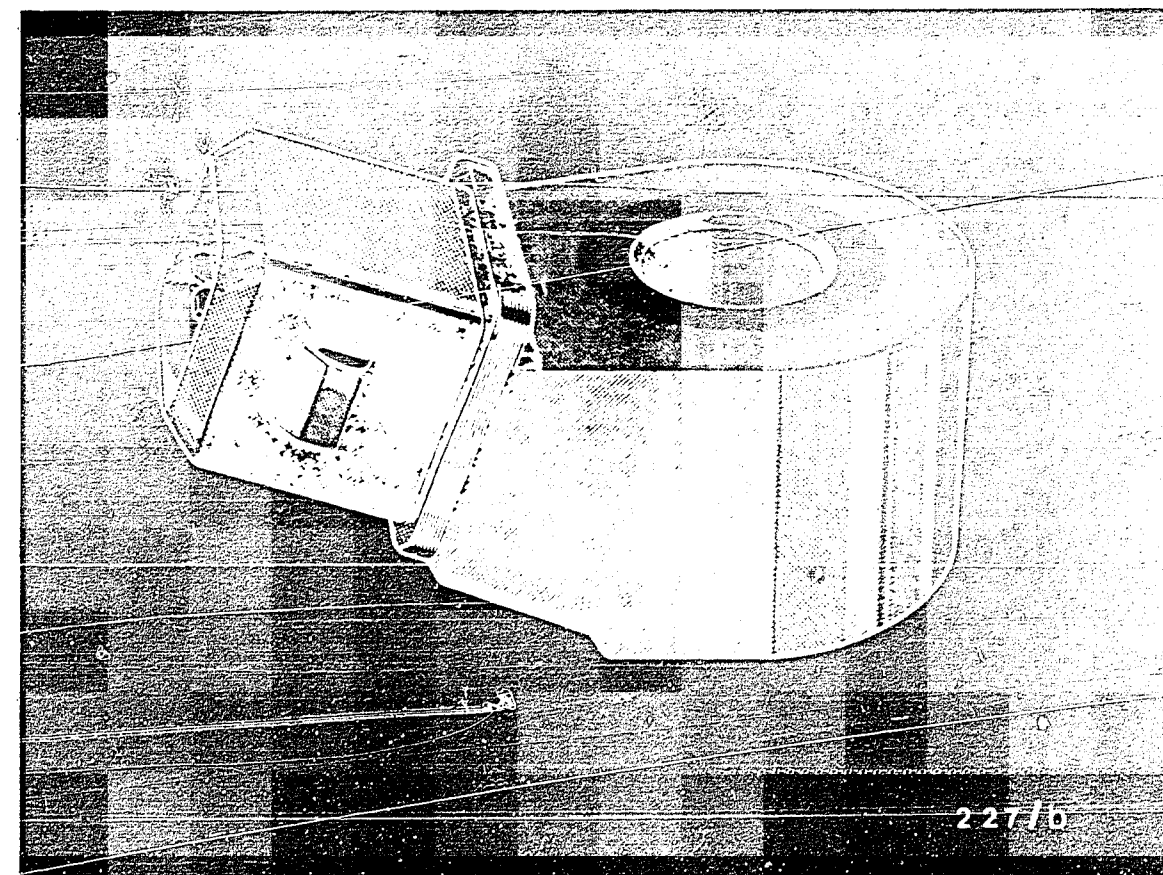
## Description

The knock sensor contains an active piezo-ceramic element.

It is screwed to a chosen position on the engine block and sends a structure-borne signal which is processed further by an electronic control unit.

## User

Saab is the first vehicle manufacturer to use the knock sensor which is being fitted to various turbo vehicles.



## Components

Knock sensor 0 261 231 ..\*

\* The exact part numbers are given on the appropriate vehicle-equipment micro-cards AA... .

## Service/exchange parts

The knock sensor is a service part and is supplied by Bosch.  
The remaining components of the knock control are products made by other firms.

## Technical documentation

Technical Bulletin "New Product"  
VDT-I-227/10.

## Training

Special training is not necessary.

## Retrofitting

The knock sensor is not intended for retrofitting.

## Warranty procedure

Components on which a claim is being made should be sent for inspection during the warranty period to our representative in your country. He should forward it to:

ROBERT BOSCH GMBH  
KH7LAV-Auspackraum  
zur Weiterleitung an K1/VAK2  
7000 Stuttgart 30  
Federal Republic of Germany

This regulation applies until further notice.

## Published by:

ROBERT BOSCH GMBH  
Division KH  
Technical After-Sales Service (KH/VKD 2)

Please direct questions and comments concerning the contents to our authorized representative in your country.

## TECHNICAL BULLETIN

### BREAKERLESS TRANSISTORIZED IGNITION SYSTEM

|22|

#### Warranty note

VDT-I-227/103 En

#### Hybrid-construction trigger boxes

0 227 100 100 for ignition dist. with Hall gen. (TCI-h)  
0 227 100 102 for ig. dist. with ind.-type pulse gen. (TCI-i)

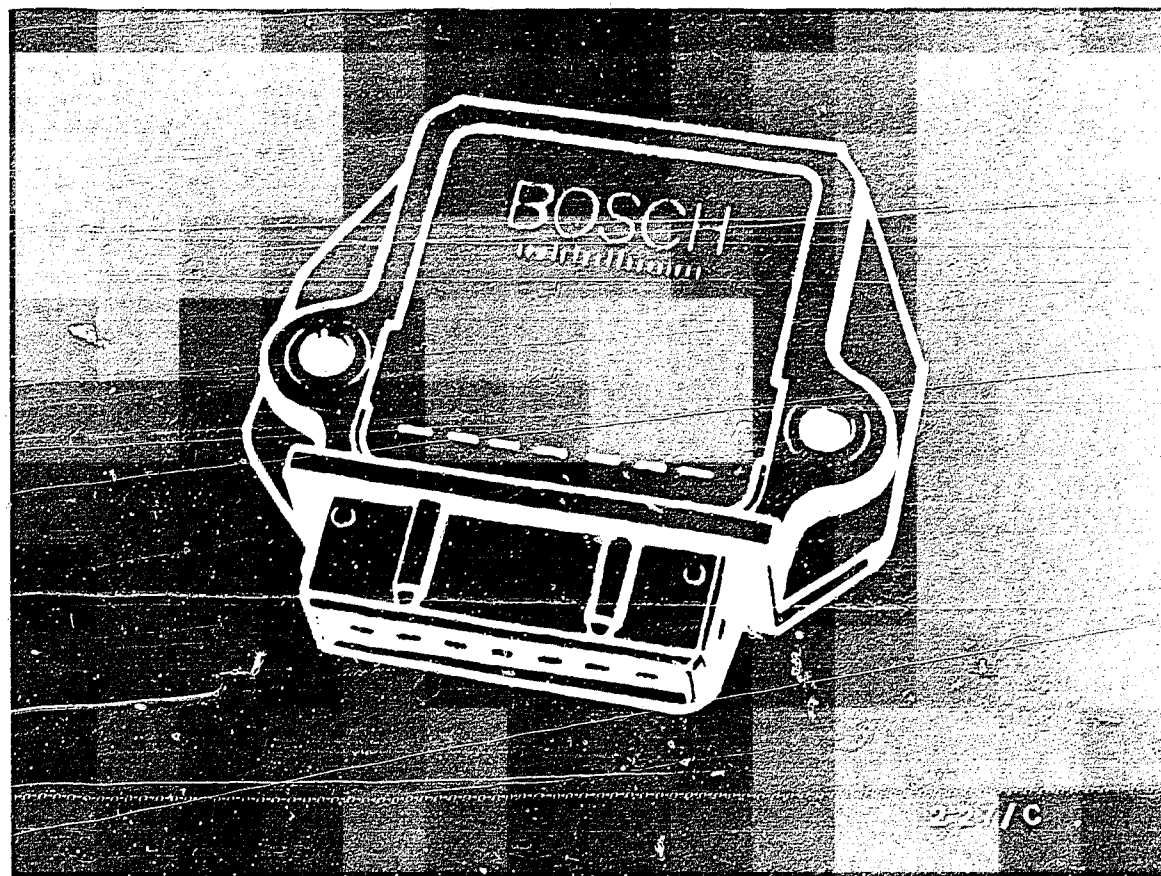
## Warranty procedure

If the complaints are justified, all these hybrid trigger boxes are to be sent, along with completed warranty documents, to your authorized representative for forwarding to the following address:

ROBERT BOSCH GMBH  
KH/LAV - Auspackraum  
zur Weiterleitung an K1/VAK 21  
D-7000 Stuttgart 30

This instruction remains valid until further instruction.





Apart from the well-known TCI trigger boxes 0 227 100 0.., trigger boxes of hybrid construction have been fitted as standard since 9.78 (upper illustration).

Published by:

ROBERT BOSCH GMBH  
Division KH  
Technical After-Sales Service (KH/VKD 2)

Please direct questions and comments concerning the contents to our authorized representative in your country.

## TECHNICAL BULLETIN

### NEW DESIGNATIONS FOR IGNITION SYSTEMS

VDT-I-227/108 En  
01.1983

Supersedes 5.1981 edition

The introduction of new ignition systems has made it necessary to reclassify all designations.

The designations listed below will be used immediately in KH workshop and sales literature.

Designation	Abbreviated code	Meaning	Switching	Ignition ctrl. and spark adv.	High-voltage dist.
Coil ignition	ZS (CI)		Mechanical (breaker points)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistorized coil ignition	TSZ-K (TCI-c)	K=breaker-triggered	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Trigger box with conventional circuit techniques	TSZ-I * (TCI-i)	I=Induction-type pulse gen.	Electronic (trigger box)	Mechanical (ignition dist.)	Mechanical (ignition dist.)
	TSZ-H (TCI-h)	H=Hall generator	Electronic (trigger box)	Mechanical (ignition dist.)	Mechanical (ignition dist.)

Designation	Abbreviated code	Meaning	Switching	Ignition ctrl. and spark adv.	High-voltage dist.
Transistorized ignition	TZ-I * (TI-1)	I—Induction-type pulse gen.	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
(Trigger box in hybrid technique)	TZ-H * (TI-h)	H—Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Breakerless semi conductor ignition with or without knock control	EZ (EI) (EZ-K) (EI-k)	K= Knock control	Electronic (trigger box or control unit)	Electronic (control unit)	Mechanical (ignition distributor or high-voltage distributor)
Distributor-less ignition with or without knock control	VZ (FEI) VZ-K (FEI-k)	K= Knock control	Electronic (control unit)	Electronic (control unit)	Electronic (dual-spark ignition coil, or 1 ignition coil for each spark plug)

\* Note:

The ignition system can also be equipped with a DLS unit (digital idle stabilization) or with an ELS unit (electronic idle stabilization) or with an ESV unit (electronic ignition retardation).

Published by:

Robert Bosch GmbH  
Division KH  
After-Sales Service Department for  
Training and Technology (KH/VSK)

Please direct questions and comments concerning the contents to our authorized representative in your country.

## MOTOR VEHICLE SERVICE INFORMATION

INCORRECT DISPLAY OF ROTATIONAL SPEED VDT-I-Gen. 030 En  
AND DWELL ANGLE ONLY WITH TRIGGER 02.1981  
BOXES 0 227 100 .. (TCI-l, TCI-h)  
WITH CURRENT LIMITATION Supersedes ed. 6.1980

For additional information, see VDT-I Gen. 032 En

### 1. General

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period, the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle when testing the ignition system. However, there is no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Incorrect displays may occur with the testers listed below:

MOT 001.00	Rotational-speed	KTE 001.00
001.01	display O.K. with	001.02
001.02	these testers	001.03
001.04		
002.00		

By now, the following vehicles may be fitted with breakerless ignition systems with current limitation:

Audi	(Bosch/Fairchild ignition system)	Mazda	(Mitsubishi ignition system)
BMW	(Bosch ignition system)	Mitsubishi	(Mitsubishi ignition system)
Citroen	(Delco ignition system)	Nissan	(Hitachi ignition system)
Fiat	(Delco ignition system)	Datsun	(Bosch ignition system)
Ford	(Delco ignition system)	Peugeot	(Bosch ignition system)
		VW	(Bosch/Fairchild ignition system)
General Motors	(HEI ignition system)	Bosch transistorized ignition system for retrofitting 0 227 100 920	

### 2. Test instructions

#### 2.1 Rotational speed

Incorrect rotational-speed display can be recognized as follows:

If one starts at the idle speed and slowly increases the engine speed, then the incorrect display can be recognized by an abrupt reduction in the rotational-speed display (e.g. from 2400 min<sup>-1</sup> to 1200 min<sup>-1</sup>).

It is, however, possible to attain correct rotational-speed measurements:

Connect a ballast resistor of 0.9 or 1.0 Ohms (see Fig.) in series in the line to term. 15 of the ignition coil (take care not to cause a short circuit). After the rotational-speed measurement, the ballast resistor must be removed (otherwise starting difficulties and misfiring). Connect tester as per operating instructions.

#### Suggestion for user manufacture

##### Required parts:

1 ballast resistor 0.9 Ohms	Part no. 0 227 900 002
or	
1 ballast resistor 1.0 Ohms	Part no. 0 227 900 101
2 blade receptacles	Part no. 1 901 355 881
e.g. approx. 0.2 m cable, 1.5 mm <sup>2</sup> e.g.	Part no. 6 210 150 150
2 insulated clips	Commercially available

MOTORTESTER CONVERSION

VDT-I-Gen. 032 En  
06.1980

Incorrect display of rotational speed,  
dwell angle and ignition point  
only with trigger boxes  
0 227 100 .. (TCI-i, TCI-h) with current limitation

For additional information, see  
VDT-I-Gen. 030 of 6.80

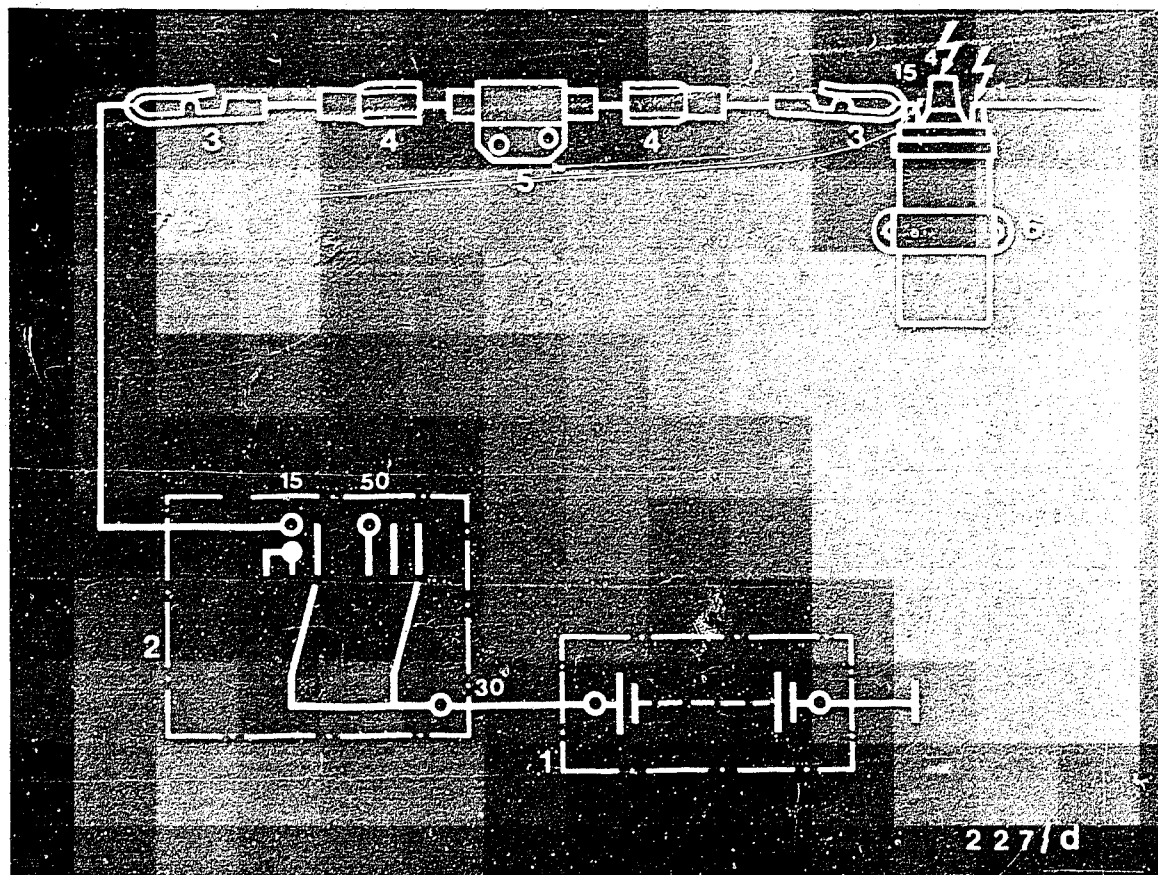
Re.: Motortesters EFAW 268  
268 S 10  
269  
214 B  
AE 2000

1. General

Please make sure that the above-mentioned motortesters in your workshop and at your customers (e.g. motor-vehicle workshops, oil companies, gas stations, vocational schools etc.) are converted. The conversion is subject to payment and is carried out by the K7 after-sales service of the responsible BG. The standard time is 15 work units (with fitting of switch).

2. Why motortester conversion?

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period, the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle as well as to incorrect triggering of the meter when testing the ignition system.



- |                     |                      |
|---------------------|----------------------|
| 1 = Battery         | 4 = Blade receptacle |
| 2 = Ignition switch | 5 = Ballast resistor |
| 3 = Clips           | 6 = Ignition coil    |

High-voltage arrow: Dangerous voltages  
(400 V - 25 kV)

2.2 Dwell angle

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.

2.3 Ignition point

Is displayed correctly. Connect tester as per operating instructions.

Published by:

Robert Bosch GmbH

Division KH

After-Sales Service Department for

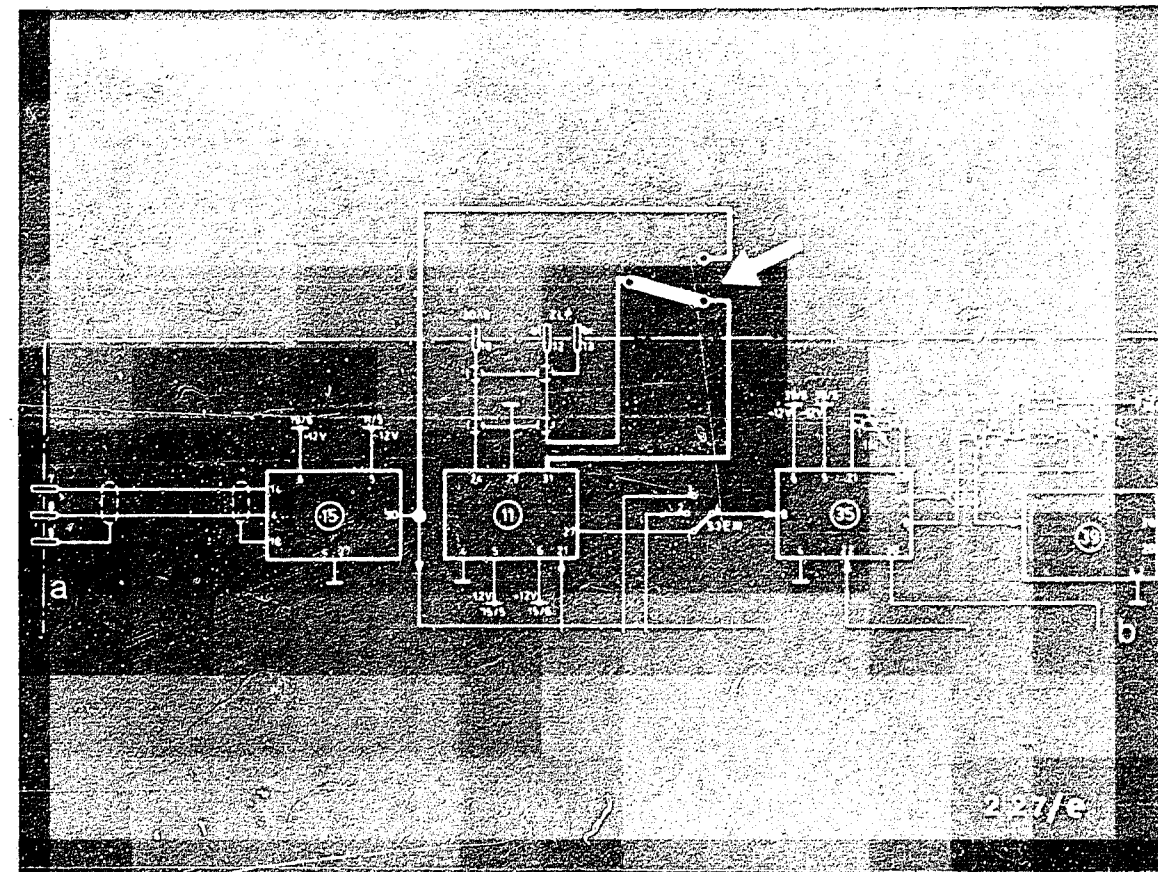
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There is, however, no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Since, with the above-listed motortesters, the timing strobe is triggered by the signal-path dwell-angle meter, this incorrect triggering also leads to incorrect flashing and thus to an incorrect display of the advance angle.

### 3. Conversion measures

The situation is to be remedied by modifying the wiring of the testers so that the timing strobe is triggered by the clamp-on induction pickup and the pulse shaper stage.



a = Clamp-on induction pickup  
b = (Extract from WJF 508/1, Page 53)

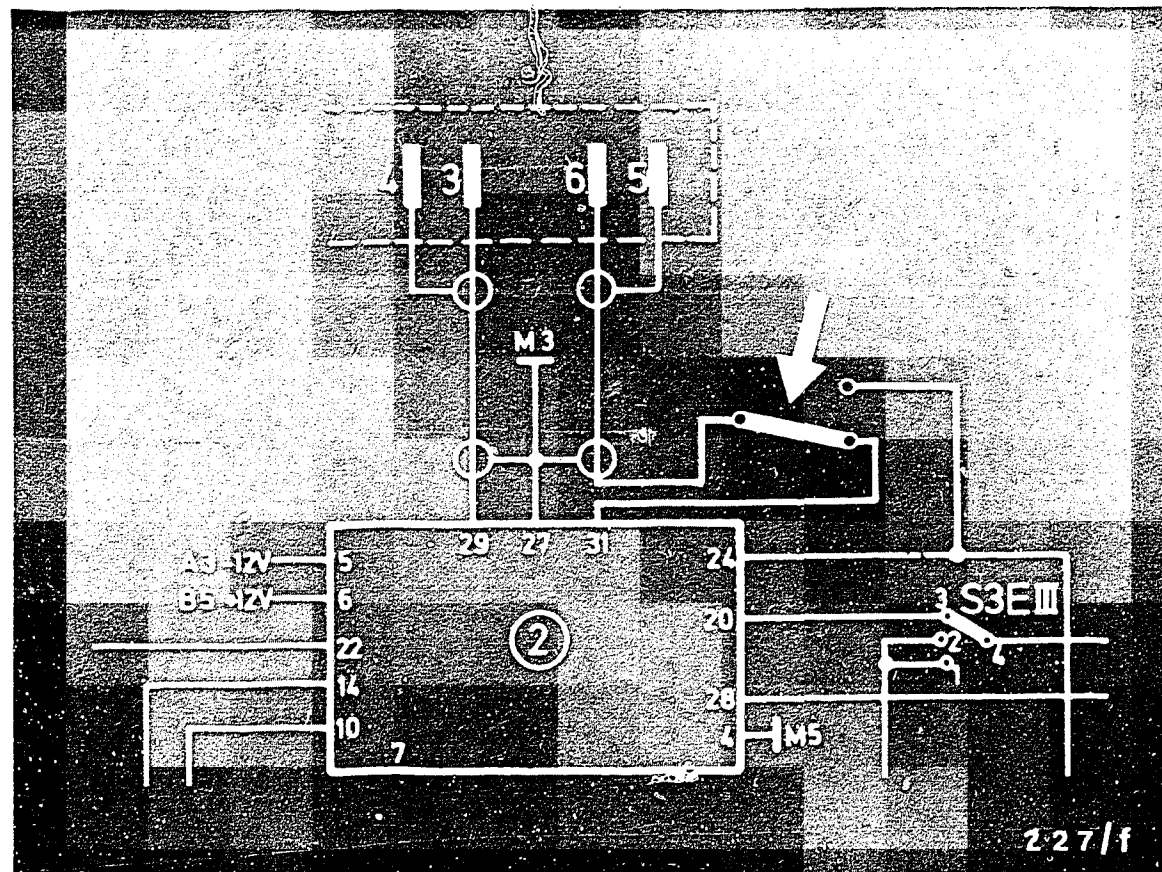
EFAW 268, 268 S 10, 269, AE 2000

Remove the line of the ZLP from pin 31 of printed board 11 (coupling stage) and connect to pin 30 of printed board 15 (pulse shaper stage) via a switch with change-over contact (e.g. 0 341 500 803).

In addition, a new line must be connected from pin 31 of printed board 11 to the other contact of the switch with change-over contact.

Arrow points to switch with change-over contact.





(Extract from WJF 503/1, Page 64))

#### EFAW 214 B

Remove the line from terminal 6 of printed board 16 to pin 31 of printed board 2 (coupling stage) and connect to pin 24 of the same printed board via a switch with change-over contact (e.g. 0 341 500 803).

In addition, a new line must be connected from pin 31 of printed board 2 to the other contact of the switch with change-over contact.

Arrow points to switch with change-over contact.

By fitting the switch with change-over contact in the front panel of the motortester, it is possible to switch over from standard ignition systems to those with current limitation. We recommend that the switch positions be marked correspondingly:

e.g. "Standard" – "Current limitation". These conversion measures have already been published in the K7 information sheet KJF 28/7911.

#### 4. Test instructions

##### 4.1 Standard ignition systems

Switch position: "Standard".

All other tester connections as per operating instructions.

##### 4.2 Ignition systems with current limitation

Switch position: "Current limitation".

In order to trigger the timing strobe, the induction-type pulse generator (clamp-on pickup or red pickup) must always be connected during the measurement.

The selector switch for ignition systems built into the motortester must be switched to standard coil ignition (not to TCI) with these ignition systems.

All other tester connections as per operating instructions.

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.

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TESTS ON ELECTRONIC IGNITION  
SYSTEMS (TCI, TI)  
TESTER INSTRUCTIONS

VDT-I-Gen. 035 En  
03.1981

The following tests are listed in older  
and current Tester operating instructions  
or in "Trouble-shooting with the oscilloscope":

- \* "Separate ignition coil test"  
(Concerns EFAW 213, 214, 268, AE 2000)
- \* Calculating the "ignition voltage reserve"  
(Concerns EFAW 213, 214, 268, AE 2000  
and MOT series).
- \* "Intensified insulation test"  
(Concerns EFAW 213, 214, 268, AE 2000,  
and MOT series).

Nowadays, transistorized ignition systems  
deliver more than 30,000 V secondary voltage.

To avoid damage to ignition coil, ignition  
cable and ignition distributor by voltage  
flashovers, the tests listed above should  
n o t be carried out on transistorized  
ignition systems.

The contents of this Service Information has  
already been published in the K7 Information  
K7-VJF 17/8012.

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For production reasons:  
continued on the following  
coordinate.



For production reasons:  
continued on the following  
coordinate.

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IMPRESSUM

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